

CALCUTTA *
GOVERNMENT OF INDIA CENTRAL PRINTING OFFICE,
8, HASTINGS STREET.

Cabbage, see under *Brassica (oleracea) capitata*

The Cabbage was introduced into India by Europeans at an early date. It is now cultivated in the plains, during the cold weather, and in spring and summer on the hills. It is largely grown in the vicinity of towns and cantonments, and is as much eaten by Natives as by Europeans. Natives cook the cabbage into curry. The 'drum head' form is that most generally cultivated by the people of India. (*Cameron, Mysore*)

Cabbage-rose, see *Rosa alba*, *Linn*, *ROSACEÆ*.

CABINET-WORK, FURNITURE, AND GENERAL CARPENTRY,

Timbers used for—

Abies dumosa
A. Smithiana
Acacia arabica
A. melanoxydon
Acer pictum
Aerocarpus fraxinifolius
Adenanthura pavonina
Adina cordifolia
Alaogium Lamarckii
Albizia julibrissin
A. Lebbek
A. odoratissima
A. stipulata
Ainus nitida
Alseodaphne ? petiolaris
Alstonia scholaris
Amoora spectabilis
Anogeissus latifolia
Anthocephalus Cadamba
Aporosa dioica (The Coco-wood of commerce)
Aquilaria Agallocha (Eagle wood of commerce)

Areca Catechu
Artocarpus Chaplasha
A. hirsuta
A. integrifolia
A. Lakoocha
A. nobilis
Atalantia missionis
Averrhoa Carambola
Barringtonia acutangula
Bassia latifolia
B. longifolia
Bruguiera gymnorhiza
Buchanania latifolia
Bursera serrata
Calamus Rotang
Calophyllum inophyllum
Carallia integerrima
Careya arborea
Cassia tumonensis
Cedrela Toona
Cedrus Deodara
Ceratonia Siliqua
Chickrassia tabularis

CACTUS
indicus.

Cabinet-work.

Chloroxylon Swietenia.
 Cinnamomum glanduliferum.
 Cordia Mucleodu.
 Coriaria nepalensis.
 Cupressus sempervirens.
 Dalbergia latifolia.
 D. Sissoo.
 Dichopsis polyantha.
 Diospyros cordifolia.
 D. ebenum.
 D. Kurzii.
 D. montana.
 Dipterocarpus turbinatus.
 Dolichandrone stipitata.
 Ebreitia laevis.
 Elaeodendron glaucum
 Erythrina indica.
 Excoecaria Agallocha
 E. sebifera.
 Feronia elephantum.
 Ficus bengalensis.
 F. retusa.
 Garcinia Cambogia.
 G. Morella.
 Ginta elegans
 G travancorica.
 Gmelina arborea.
 Grevillea robusta.
 Guazuma tomentosa.
 Gyrocarpus Jacquini.
 Hardwickia binata.
 Hemitelia littoralis.
 Holarrhena antidysenterica.
 Homalium tomentosum.
 Hopea parviflora
 Ixora parviflora.
 Juglans regia.
 Lagerstroemia microcarpa.
 Lophopetalum Wallichii.
 Melia Azadirachta.
 M. Azedarach.
 Meliosma Wallichii.
 Memecylon edule
 Mesua ferrea
 Michelia Champaca.
 M. excelsa.
 M. oblonga.

Mimosa Elengi.
 Morus cuspidata.
 M. serrata.
 Murraya Koenigii.
 Myrsine semiserrata.
 Nuclea rotundifolia.
 Nephelium Longana.
 Odina Wodier.
 Ougeinia dalbergioides.
 Parrotia Jacquemontiana.
 Pentace burmanica.
 Phyllanthus Emblica.
 Pistacia integerrima.
 Platanns orientalis.
 Podocarpus bracteata.
 P. latifolia.
 Pterocarpus indicum.
 Poinciana elata.
 Polyalthia cerasoides.
 Premna tomentosa
 Prosopis glandulosa.
 P. spicigera.
 Prunus Puddom.
 Pterocarpus indicus.
 P. Marsupium.
 P. santalinus
 Pyrus lanata.
 Quercus semecarpifolia.
 Rhododendron arboreum.
 Rhus Cotinus.
 Santalum album.
 Shorea robusta.
 Stephegyne parvifolia.
 Stereospermum chelonoides.
 S. xylocarpum.
 Strychnos Nux-vomica.
 Swietenia Mahagoni.
 Talauma Rabaniana.
 Tamarindus indica.
 Taxus baccata.
 Tecoma undulata.
 Tectona grandis
 Terminalia Chebula.
 Thespesia populnea.
 Ulmus integrifolia.
 Vitex leucoxylon.
 Wrightia tomentosa

Cacalia Kleinia, *Herb Madr*, see *Notonia grandiflora*, DC, COMPOSITÆ

C. Kleinia, as in *O Shaughnessy*, see *Onosma bracteatum*, Wall,
BORAGINACEÆ

Cacao, see *Theobroma Cacao*, Linn, STERCULIACEÆ

Cactus indicus, *Revb*, see *Opuntia Dillenii*, Haw, CACTEÆ.

CASALPINIA

Bonducella.

The Fever-nut.

Habitat—Found all over India, especially in Bengal, Burma, and
Sou

OIL.
 From seed. 7
 From leaves. 8
MEDICINE.
 Seeds. 9
 Powder. 10

is also useful in convulsions and palsy. "The oil is used as a cosmetic; it is said to soften the skin and remove pimples." (*Surgeon-Major W. Dymock, Bombay.*) An oil is also said to be prepared from the leaves.

Medicine.—**THE SEEDS OR NUTS.**—The seeds are viewed as possessing well-marked antiperiodic properties, and are largely used by the natives instead of quinine. For this purpose they are pounded with black pepper, from 5 to 30 grains being regarded as the proper dose. Ainslie seems first to have drawn the attention of Europeans to this powder, but even up to the present date it has not apparently taken the position which it deserves as a tonic and febrifuge. It was made official in the *Indian Pharmacopœia*, the dose of powder being 18 to 15 grains.

"In *Intermittent Fevers*, especially in those of the natives, this remedy has been found very useful. It is best given in the following form: Take of Bonduc seeds, deprived of their shells and powdered, one ounce; black pepper powdered, one ounce; mix thoroughly, and keep in a well-stopped bottle. The dose is from 15 to 30 grains three times a day.

O'Shaughnessy remarks, that "Nitric acid reddens the nut and subsequently is a valuable febrifuge." "*Nitric acid reddens the nut and subsequently is a valuable febrifuge.*" "*Nitric acid reddens the nut and subsequently is a valuable febrifuge.*" "*Nitric acid reddens the nut and subsequently is a valuable febrifuge.*"

In an official report, of the *Indian Pharmacopœia* remark that "the seeds are very useful and cheap, and are valuable in all ordinary cases of fever. They have also been found useful in the treatment of Aconitum heterophyllum in their action, but are preferable to it for cheapness. The root-bark is inferior to the seed, and is substituted for Pulv. Aconitum heterophyllum, and for Gen. India the seeds are considered to be hot and dry, useful for swellings, restraining hæmorrhage, and keeping off infectious diseases. They are also given internally in leprosy, and are thought to be antihelmintic." (*Surgeon-Major W. Dymock, Bombay.*) Dr. Ch. Rice writes to the author that the "seeds are used among the Malays as astringent tonics in bowel complaints. They have also been reported as facilitating childbirth."

In debility after fevers and other diseases, "the bark of the root of Bonduc shrub in 10-grain doses is reported to be even more effectual than the seeds themselves." (*Waring.*) It would thus appear that a difference of opinion prevails regarding the properties of the root, but all authors agree in the value of the seeds.

The powdered seeds, with castor oil, and Dr. Dymock says the seeds are in Bombay sold for Rs 12 a cwt.

THE LEAVES—"In disorders of the liver the tender leaves are considered very efficacious." (*Mr. T. N. Mukharji's Amst. Cat.*) Drury

The Fever-nut.

CÆSALPINIA
Bonducella.

says that in Cochin China the leaves are reckoned as a deobstruent and emmenagogue, and that an oil expressed from them is useful in convulsions, palsy, and similar complaints. Dr. Ch. Rice informs the author that "the young leaves are used in intermittent fevers and for expelling intestinal worms."

At the late Colonial and Indian Exhibition a pale orange-coloured nut was shown by the West. A vated form of this plant is also shown.

"The active principle has not yet been adequately examined. It may perhaps occur in larger proportion in the bark of the root, which is said to be more efficacious than the seeds in the treatment of intermittent fever.

"In order to ascertain the chemical nature of the principle of the seeds, one ounce of the kernels was powdered and exhausted with slightly acidulated alcohol. The solution, after the evaporation of the alcohol, was made alkaline with caustic potash, which did not produce a precipitate. Either now shaken with the liquid completely removed the bitter matter, and yielded it in the form of an amorphous white powder, devoid of alkaline properties. It is sparingly soluble in water, but readily in alcohol forming intensely bitter solutions; an aqueous solution is not precipitated by tannic acid. It produces a yellowish or brownish solution with concentrated sulphuric acid, which acquires subsequently a violet hue. Nitric acid is without manifest influence. From these experiments, we may infer that the active principle of the Bonduc seed is a bitter substance not possessing basic properties." (*Fluck. and Hanb. Pharmacog.* pp. 212-13.)

SPECIAL OPINIONS—§ "The kernel of the seeds is decidedly tonic and antiperiodic, but much inferior in this respect to the cinchona preparations. It is useful in dispensary practice where economy is a desideratum" (*Surgeon R. D. Murray, M.B., Burdwan*) "Nata is decidedly antiperiodic, but feeble in its action, requiring 3 to 3½ grs of the powdered seed to check an ordinary intermittent fever." (*Surgeon R. L. Dutt, M.D., Pubna*) "I have often used it, as an antiperiodic, it is certainly of value. The powdered seed smoked in a hukka, in lieu of tobacco, is said to be very efficacious in colic." (*Surgeon-Major C. W. Calthrop, M.D., Morar*) "In doses of 5 to 20 grains, the powdered seeds constitute an efficient antiperiodic." (*Surgeon-Major C. W. Calthrop, M.D., Morar*)

MEDICINE.
15

...y practice."
...powder, has
...the tertian
...of cases."
...is antiperio-
...n convales-
cence, after fevers" (*Assistant Surgeon Shib Chunder Bhattachary,*
Chanda, Central Provinces) "The seeds are said to be useful in colic (dose one seed), and the ash as an external application to ulcers." (*Surgeon*
Joseph Parker, M.D., Poora) "The burnt seeds are used with alum and
burnt areca-nut as a dentifrice, useful in pory gums, gum-bolls, &c., also

The American Sumach.

in intermittent fever and debility." (*Brigade Surgeon F. H. Thornton, B.A., M.B., Monghyr.*) "Sometimes used as a febrifuge in doses of about 30 grains, but has a nauseous taste and does not appear to be an efficacious

antipyretic, and from 10 to 30 grains as a tonic." (*Honorary Surgeon Moseen Sheriff, Khan Bahadur, Triplicane, Madras.*) "A cake made of 30 grains of the powdered kernel, the contents of one egg, and fried in *ghi*, is taken twice a day in cases of acute orchitis, ovaritis, and scrofula. *Antipyrin* is used locally for scorpion-stings." (*Surgeon* or *ghi*, are boiled with castor oil or *ghi*, are esticles. The tender leaves are said to be most efficacious." (*Honorary Surgeon P. Kinsley, Ganjam, Madras.*) "The best vegetable antiperiodic used by natives. This drug might prove very useful if its active properties were brought into a concentrated form as an extract or otherwise." (*Surgeon W. G. King, M.B., Madras Medical Dept.*) "The nuts ground down and made into a paste are useful in dissolving glandular swellings, buboes, and swelling of the testicles in the acute stage." (*Honorary Surgeon Peter Anderson, Guntur, Madras Presidency.*) "Both the nut and the leaf are used internally and externally with good effect in recent orchitis. It is powerless against hydrocele." (*Native Surgeon Ruthnam T. Moodelliar, Chingleput, Madras Presidency.*)

16
Amulets.
17
Rosaries.
18

Domestic Uses.—The nuts are used for making into bracelets, necklaces, rosaries, &c. (*Guide to the Kew Museum.*) "Necklaces of the seeds of *Molucca Beans* are worn by pregnant women as a charm to prevent sickness, (Bombay.) "The seeds are used in *Cameroon, Bangalore.*) "In Egypt the seeds are used by women as amulets against sorcery. In Scotland, where they are frequently thrown upon the seashore, they are known as *Molucca Beans.*" (*Christy, New Commercial Plants, No. 4, p. 48.*)

Dr. Ch. Rice writes to the author that "in the Malay Archipelago they are used for counters and playthings, especially in the game known as *tiongka*."

Cæsalpinia coriaria, Willd.

THE AMERICAN SEMACH OF DIVI-DIVI.

Vern.—Libi-dih, BOMB.; Amrique-la-sumdq, DUK.; Shimak, TAM.; Sumdique-amriqah, ARAB. PERS. Vilavati-aldekayi, KAN.

References.—*Brandis, For. Fl.*, 157; *Gamble's Man. Timb.*, 135; *Governor's Report*, 1857, 1858; *Ind. — Emerson, Vol. IX.*, 99-103, Vol. II., 64, 730, *Commercial Products of Christy's New Com.*

The American Sumach

CÆSALPINIA
coriaria.*Pl., Part II, 21, Drury's Us Pl., 92, Mueller's Extra-Tropical Plants, 56*

Habitat—A small tree, native of South America and the West Indies, found in marshy situations in New Grenada, Mexico, Venezuela, North Brazil, and Jamaica. Introduced into India and now almost acclimated.

Properties and Uses—

Tan—The sinuous pods of this plant have, within recent years, begun to take an important place amongst tanning materials. The chief drawback seems to be in the fact that if the seeds are not removed, the oil which they contain, induces an injurious fermentation, which results in a discoloration

TAN
Pods
20

or to prepare from the fresh pods a tanning resinous extract. Either of these suggestions would most probably minimise the danger, and would have the effect of lessening the charges on freight. Recently, a large exhibition, the Secretary of which was accessible, was accessible, a favourable report was given at London in connection with the Colonial and Indian Exhibition were pronounced far inferior to the usual supply to be had in the market. The tanners who visited the Exhibition would not look at them, while they professed themselves anxious to investigate some of the paler-coloured barks exhibited, such as *Acacia Catechu* and *A. leucophloea*, and the pods of *A. arabica*.

Powder,
21

A considerable amount of interest has, within the past few years, been taken in the subject of the introduction or extended cultivation of the Divi-divi in India. The following extracts from a memorandum on this subject, published by the Government of India, Revenue and Agricultural Department, may be reproduced here—

Extracts,
22

"Dr. Wallich introduced the Divi-divi plant into India about the year 1830, and it has now been thoroughly acclimatised in South India, which, in soil and climate, resembles its original home. As the plantation near the Government Harness Factory at Cawnpore proves, however, it can be, with a little care, successfully cultivated in the drier climate of Upper India. But the hot winds in the summer and the frost in the cold weather are, unfortunately, very destructive to the young seedlings. The seeds therefore should, in the first instance, be sown in a nursery in May or June, before the commencement of the rains, and the seedlings should

c, it is
ons of
estary
The

ornamental plant

"The tree is cultivated for its seed pods, which contain a large quantity of a most powerful and a quickly acting tanning material, rather too strong to become a substitute for oak or *Laurel* bark, but very valuable as a cleaning and brightening agent in the after process of currying, when it takes the place of sumach or *Rhus coriaria*. Both in England and at the

CÆSALPINIA
coriaria,

The American Sumach.

Cawnpore Government Factory it is used as a substitute for sumach, which is a dearer article.

"The actual demand for Divi-divi pods is not known. England imports about 4,000 tons every year, in addition to about 12,000 tons of sumach. But as Divi-divi is gradually ousting the latter, its demand in France, ammes of t has been in India,

great advantage in its cultivation is, that the tree requires no care after it has once grown up, and the proceeds are net gain, *minus* the trifling cost of picking the pods. The ground underneath can be utilised for raising fodder grass, and the falling leaves as fuel or manure, thus meeting the three great wants of the Upper Provinces. An acre of Divi-divi is supposed to yield not less than one ton of marketable produce, valued in India about Rs 100, in England Rs 150." (Mr. T. N. Mukharji, Revenue and Agricultural Department)

CULTIVATION. The information on this subject might be supplemented by a more detailed account of the methods of cultivation in India as follows:

as to the prospects of the plant becoming a commercial success. In Mr. Duthie's experiments at the Saharanpur Botanic Gardens the trees are planted 15 feet apart each way. The largest plantation of Divi-divi in India is that belonging to Mr. J. B. Carbozo, of Perambore, Madras. This gentleman has a plantation of about 600 trees; the trees being 22 feet apart. Dr. Kinnear's report for 1890, 91, states that the

Divi-divi trees here. They yield pods yearly every year and the seeds are regularly distributed gratis to all applicants.

Dr. Bidie of Madras thinks the tree grows best at an elevation of 2,000 feet above the level of the sea, by others, a dry and light soil suits it best; and again, its favourite soil is a heavy clay associated with *Acacia leucophloea*. Some writers do not think it can ever be cultivated on a large scale in Bengal, because the climate is too moist and the soil not suitable, while Baron von Mueller recommends its introduction in the salt-marshes of Australia. The export of the pods from the Western Presidency is increasing.

A correspondent in *The Madras Times* says "The Divi-divi pods are employed in the manufacture of ink, and contain 50 per cent. of pure tannin. I have seen a large plantation of this tree [Mr. C. ... author that this is incorrect, only a few trees exist there], and that its pods are extensively used for giving the skins the Bangalore skins. It is employed a solution of The ink used in most of the Government is made from this plant. The cultivation of this elegant shrub is very easy. The seeds should be sown in March, and the young plants can be removed from the nursery during the following rainy season; they require some

The *Cæsalpinia digyna*.CÆSALPINIA
digyna.

watering till they have attained the height of 3 feet, after which no more care is necessary. The plant grows luxuriantly in a clayish calcareous soil, but very slowly in red soil, as I have observed at the Red Hills near Madras." Dr. Ch. Rice draws the author's attention to the fact that Professor Flückiger, in his *Pharmakognosi* [2nd] I, 245, mentions that ink

such as is very abundant in this Presidency, may might be worth collecting, freeing of the seeds, and shipping in the form of a clean powder closely packed in bags; but to be really remunerative and to show conclusive results, experimental shipments should be tried on a much larger scale than has yet been attempted, and means of continuing the supply must be available, as manufacturers will not try expensive experiments unless with some certainty of being able to get more of the substance tested, in the event of success."

Medicine—According to Dr. Bidie, the pods are astringent. The powder prepared from them is of a light-yellow colour and astringent taste; it has been brought forward as an antiperiodic by Dr. Cornish, who administered it in ninety-four cases of intermittent fever, many of these severe

MEDICINE.
Pods.
24

pods astringent, antiperiodic, tonic
'Apothecary Thomas Ward,
; leather, and makes very
Waltair, Vizagapatam)
se (Bomb. Gaz., XV., Pt. I

(65), weight 56 lbs.

TIMBER,
25
26

Cæsalpinia digyna, *Roott*; *Fl Br. Ind*, II, 256.

Syn.—C OLEOSPERMA, *Roxb*, *Ed C B C*, 356

Vern.—*Vakers mul*, HIND, *Umul kuchi*, BENG, *Nuni gatcha*, TEL, *Vakeri-chebhate*, *vakers-mula*, BOMB, *Sunletthé*, BURM

Habitat—A prickly tree of the Eastern Himalaya, Eastern and Western Peninsulas, and Ceylon.

Tan.—Dr. H. McCann, in his *Dyes and Tans of Bengal*, says that in Cuttack the pods of what appears to be this plant are sold as a tan under the name of *Kunti*. The word *Kunti-paras* would appear to be

TAN.
27

Dil.—Roxburgh says that an oil is expressed from the seeds, which is used for lamps

OIL.
28
MEDICINE.
29

The Sappan wood.

CÆSALPINIA
Sappan.

printing, its price being about R12 a cwt. Chips of the wood steeped in water yield a red colour. This is intensified by alkalis. Combined with turmeric and sulphate of iron, it gives the colour known as *Kalejai* (or liver-colour, "*lit de-vin*") With indigo it gives (*sausni*) purple. Sappan colour, however, is not permanent, being formed through the presence of the soluble substance Brazilin. Tannin and alum are used as mordants

into cold water - - - - - Dye-tincture.
37

mixed with
ing colour
koshi (sulphur)

wide. In the case of the wood, it is either cut into pieces or pounded and then boiled in water from 5 to 8 hours; 12 chittacks of *bakam* wood are boiled in 25 seers of water till 10 seers remain. The solution is put aside, and the same wood is again boiled in another 25 seers of water

the necessary consistency and tint

Mr. Thomas Wardle, in his *Report on the Dyes and Tans of India*,
- - - - -

Chip.
38

(Surgeon-Major W. Dymock, Bombay)

Medicine.—Ainslie says a decoction of the wood has the property of a powerful emmenagogue. The wood, though chiefly used as a dye, is described as a useful astringent, containing much tannic and gallic acids, and has been recommended by O'Shaughnessy, and later by the

Gulal
39

MEDICINE.
Wood
40

it is supposed
mong native
rding to Dr.
Patna, p. 15)
is prescribed
Professor
author with
of Sappan
with potash,
banum resin

with potash Sappan extract gives a larger yield than galbanum resin"
(*Pharmacographia*, &c.)

SPECIAL OPINIONS.—§ " " "
diarrhoea." (Assistant Sur
"An excellent wool dye; it
logwood. It is useful in some
and is given internally in decoction
(*Ross, Delhi*) "Emmenagog

CAJANUS indicus	The Pigeon Pea
TIMBER, 41	Structure of the Wood—Sapwood white, heartwood red The wood takes a fine polish and does not warp or crack. Weight from 52 to 61 lbs per cubic foot Mr J Cameron reports that the lac insect has recently taken to this plant in Bangalore
42	Cæsalpinia sepiaria, Roxb , Fl Br Ind , II , 256 THE MYSORE THORN Vern.—Urn, urī arlu, velu kando, aila, HIND , Phulmas, uvan (JHE LAM), kanda (KASHMIR), dodur (CHENAB), relme didrian dhar ki karer, (RAVI) andi, arlei daghaurs (BIAS), ongwa (SUTLEJJ), PB Chillara or chillur BOMB , MAR , Hotngt, KAN , Sukyanbo, BURM References —Roxb , Fl Ind , Ed C B C , 357 , Stewart Pb Pl 60 Brandis, For Fl , 156 , Kurz, For Fl, Burm I , 406 , Gamble, Man Timb , 135 Habitat A large climbing creeper which on the Himalayas, and extending to Gum — : Gaz , VII , 39) Tan —The bark is much used for tanning in the Konkan Oil —“The young pod contains an essential oil” (Bomb Gaz , XV , pt I , 65) Medicine —In Chumba the bruised leaves are applied to burns —(Stewart) Domestic Uses —Makes an impenetrable fence, said to have been planted for this purpose by Hyder Ali round fortified places (Stewart) The Chinese are said to use the seeds and pods of several species of Cæsalpinia as soap nuts This property does not appear to have been attributed to any of the species, wild or cultivated, in India
LAC 43 TAN Bark 44 OIL Pods 45 MEDICINE 46 DOMESTIC 47	CAJANUS, DC , Gen Pl , I , 541 - - - - - historic The generic name <i>Cajanus</i> is derived from the Malayan name for the plant (<i>Kafjang</i>)
48	Cajanus indicus, Spreng , Fl Br Ind , II , 217 PIGEON, NO EYE (small form) or CONGO PEA (large form), DAL or CAJIAN PEA Syn.—CYTISUS CAJAN, Linn ; CAJANUS INDICUS, Spr., C FLAVUS, DC C BICOLOR, DC Ve - " " " " " " " ". References —Roxb , Fl Ind Ed C B C , 577 Stewart , Ib Pl 60 ; Baden Powell Pb I , I , 243 Kurz For Fl Burm , I , 377 Gamble, Man Timb 123 , Thwaites En Ceylon Pl 90 ; Modeen Sheriff Suppl Pharm Ind , 81 , U C Dutt Mat Med Hind , 150 , Drury's Us fl.

The Pigeon Pea.

CAJANUS
indicus.

92; *Pidge's Ind. Fam. Prod.*, *Parsi Esth. Cat.*, 74; *Duthie and Fuller's Field and Garden Crops of the N.-W. P. and Oudh*, Part II., 20; *Atkinson's Mem. Dist.*, 49; *Church's Food-grains of India*, 179; *Balfour, Cyclop.*, Ed., 1855; *Smith's Dist.*, 322; *Treasury of Botany*.

Habitat.—Extensively cultivated throughout India even up to an altitude of 6000 feet. The *Flora of British India* regards this bush as doubtfully wild in India, and DeCandolle, in his *Origin Cult. Pl.*, views it as more probably a native of tropical Africa, introduced perhaps 3,000 years ago into India.

Properties and Uses.

Medicine.—The pulse is said to be easily digested and therefore suitable

MEDICINE.
50

Bhuttacharya, Chanda, Central Provinces.) "The pulse and leaves are mixed and made into a paste, which is warmed and then applied over the mammae to check the secretion of milk." (*Surgeon W. A. Lee, Bangalore.*) "The tender leaves are chewed." (*Brigade Surgeon J. H. Thorp*) poultice made with its seeds will check

FOOD.
Seed,
51

in the Central
Mr. J. Cameron
three forms of
Cajanus indicus:—a large form confined to garden cultivation, known as
respectively as *walada*
cultivated in the

it is grown mostly as
a subordinate crop along with *guar*, *bayra*, and cotton, but it is also, though
to a comparatively much smaller extent, grown by itself. Hence, when
it is cultivated as a mixed crop, the soil on which it is grown requires
equally to the necessities of
es the heaviest, and when
moist soil is generally most
its roots freely. About 6

N.-W. P.
52

of a higher yield than 7 maunds. The outlay on cultivation is about the same as that for millets.

In the North-West Provinces it has been calculated that there are 35

C. 52

CAJANUS
indicus.

The Pigeon Pea.

lands of acres on which this is cultivated as a joint crop, and perhaps it is under *arhar* solely. "It occupies the ground for a longer period than any other crop except sugarcane, being sown at the commencement of the rains, and not cut till the *rabi* harvest time in March and April." "It is cut with the *rabi* crops and allowed to be stacked on the threshing-floor until the threshing and cleaning of the former are completed. The leaves and pods are first of all stripped off the stems and then baled together, and the grain threshed out either by bullocks treading or by being beaten with a stick." "Frost is the principal enemy with which *arhar* has to contend. A single cold night often utterly ruins the crops of a whole district, and in the following morning the cultivators may be seen sadly cutting down the withered plants as fodder for their cattle. Its liability to damage is, however, greatly dependent on the strength of the plants, and hence the crop grown on manured land near the village site will often remain green and flourishing after a frost which has withered up those on outlying fields." (*Duttie and Fuller, Field and Garden Crops.*)

C. P.
53

"A good deal of *tár* is grown (in Nagpore); it is often raised in the same field as cotton, generally five ridges of cotton to one of *tár*." (*C. P. Gas*, 327.) "In Ráipur two kinds of *arhar* or *tár* are known, the small and early *arhar* called *haróni*, and the larger and later kind called *mih*. Both are sown at the same time, but the former ripens about two months before the latter."

BOMBAY.
54

In Thána it is grown as an early crop in uplands, often with *Elenzine corocana* and *Panicum miliaceum*, and also as a dry-weather crop in late or *rabi* soil, and in the better rice-fields. Both crops ripen in about four months, the early in November and the late in February. (*Bomb. Gas*, XIII., 289.)

PANJAB.
55

According to Stewart, "The yellow and parti-coloured kinds are not uncommon, the one as a cold-weather and the other as a hot-weather crop in the eastern and central Panjáb, and extending sparingly to the Trans-

BENGAL
56

to Roxburgh, the former requires only three months to ripen its crop but yields only one hundred-fold, while the latter takes nine months, from sowing to ripening of seed, and yields about six hundred-fold. The former is sown in September and the latter in June. The small form is known in Jamaica as the No-eye pea, and the large as the Congo pea.

w it,
dis-

stage

57

of nitrogen, starch, and oil contained in this pulse:—

Nitrogenous matter (albuminoids)
Starch or carbonaceous matter
Oil or fat

19 83 to 20 38
61 90 to 64 32
1 to 1 12

Calabar Bean.

CALABAR
bean.

of water, 3 oz. and 208 grains of albuminoids, and 9 oz. and 11 grains of starch. According to Church the nutrient ratio of *dal* would be about 1 : 3; the nutrient value 80.

The reader will be enabled to compare the relative quantities of these constituents in other species of pulse from the following table:—

Name.	Nitrogenous matter	Starchy matter	Fatty or oily matter.
<i>Cicer arctinum</i>	18.65 to 21.23	60.11 to 63.62	4.11 to 4.95
<i>Cyamopsis psoraleoides</i>	29.90	52.89	1.40
<i>Dolichos biflorus</i>	23.03 to 23.47	61.02 to 61.85	6.76 to 0.87
<i>Dolichos Lablab</i>	22.45 to 24.55	60.52 to 60.81	0.81 to 2.15
<i>Vigna Catuag</i>	24.00	59.02	1.41
<i>Ervum Lens</i>	24.57 to 26.18	59.34 to 59.96	1.00 to 1.92
<i>Glycine Soja</i>	37.74 to 41.24	29.54 to 31.08	12.31 to 18.90
<i>Lathyrus sativus</i>	31.50	54.26	0.95
<i>Phaseolus aconitifolius</i>	23.80	60.78	0.64
<i>Phaseolus Mungo</i>	23.54 to 24.70	59.38 to 60.36	1.11 to 1.48
<i>Phaseolus Mungo</i> , var. <i>radiatus</i>	22.48	62.15	1.46
<i>Pisum sativum</i>	21.80 to 25.20	61.90 to 64.32	1.32 to 1.12

(Baden Powell, *Panjab Products*, I, 243)

diarrhoea or dyspepsia (surgeon-Major H. L.
 "It is difficult of digestion and very unsuited to people who are subject to acidity and heartburn. I have always found it so" (Surgeon K. D. Ghose, *Bankura*.) Professor Church states that the irritant and

their appearance. This practice is not unknown in reference to the wheat in the south of Europe" (*Food-grains of India*) May not this fact account

FODDER.
58
DOMESTIC.
59

sides it is one of the best for producing fire by friction. Biruwood remarks that "the stalks are used in the preparation of gun-powder in the Government works at Maragon" (*Bombay Products*, 1862, page 17) Employed in the Bengal gun powder works for charcoal. (Balfour.)

Cajuput oil, see *Melaleuca Leucadendron*, Linn., MYRTACE.

Calabar bean, see *Physostigma venenosum*, Balf., LEGUMINOSAE

CALAMUS
andamanicus.

The Andamanese Calamus.

CALABAR SKINS.

60

Calabar Skins or SIBERIAN SQUIRREL SKINS.

PETITGRIS, *Fr.*; GRANWEEK, *Germ.*; VAGOR VAJO, *It.*; HJELKA, *Rus*
GRIS PEFUPNO, *Sp.*

in considerable
ed for caps, and
See Squirrels.

Also under FURS.

CALAMANDER WOOD.

61

Calamander Wood.—A beautiful kind of rose-wood obtained from
Ceylon, the timber of *Diospyros gnæsita*, which see.

Calambac, see *Aquilaria Agallocha*.

62

CALAMUS, Linn. ; Gen. Pl., III., 931.

ruminated.

The generic name *Calamus* is the Latin and the Greek *Κάλαμος*,
a reed or cane.

For a more general and popular account of the genus, see under
"Canes."

63

Calamus acanthospathus, Griff., Pl. exr., fig. 1 ; PALMÆ.

Reference.—*Gamble's Man. Timb.*, 423.

Habitat.—Khásia Hills.

64

C. andamanicus, Kurz, For Fl. Burm., II., 519

Vern.—*Chowdah*, AND.

References —*Gamble, Man. Timb.*, 424

Habitat.—Met with in the Andamans.

TIMBER.

65

Structure of the Wood.—Dr. Kurz describes it as "an evergreen
lofty, scandent, rattan-palm, the sheathed stems being as thick as the arm
and the canes up to an inch in diameter."

C. 65

The Dragon's-Blood	CALAMUS Draco.
Calamus arborescens, Griff, Pl clxxxviii	CANES 65
Vern.— <i>Danong, dandn or sanon, theing, kyanbankyen</i> , BURM	
References— <i>Gamble, Man Timb, 423, Kurr, For Fl, Burm, II, 516</i>	
Habitat.—An erect, elegant cane, often stoloniferous, met with in Pegu	
C. collinus, Griff., Pl clxxvi, Gamble, Man Timb, 423	67
Habitat.—An erect cane, met with in the Khasia Hills and in Upper Assam.	
C. (Dæmonorhops, Mart) Draco, Willd, Blume in Rumphia, II, 131-32	68
The DRAGON'S BLOOD, CALAMUS	
Vern.— <i>Aprang, ranggharat, damlakwayti, dam-ul-akhwain, jaida rumi, hiradukhi</i> , HIND, <i>Hira, dathan, hira-dukhi</i> , BOMB, MAR, GUJ, <i>ul, iban, RS</i> .	
his step-mother	
References— <i>D. L. F. I. J. K. G. C. A. N. S.</i>	
<p>dru per Pal &c The Dragon's blood of modern commerce comes chiefly from Borneo. There are, however, two distinct forms of Dragon's-blood—the modern and the ancient</p>	<p>k says "The annas to Ri forests near in Penang,</p>
<i>Properties and Uses—</i>	
Gum.—This gum is sold in dark red friable masses, from which a blood red powder is obtained, this is often met with in the bazar packed in the interior of canes	CUM 69
The fruits of <i>C. Draco</i> are clustered, each covered with beautiful imbricating scales, which are coated with a red resinous substance. The fruits are collected, placed in long bags, and violently shaken, the resinous	
has been removed by heat and bruising. The third and most inferior appears to be the refuse of this last process. It is perhaps doubtful whether this article is procured from the plant by incisions."	
Other species of <i>Calamus</i> also yield Dragon's-blood, and from the scars on the stem a resinous substance resembling Dragon's-blood is obtained from <i>Draena Draco</i> , a tree of the <i>Liliaceæ</i> and a native of the Canary Islands. A famous specimen of this tree, one often referred to by writers	
C	C. 69

CALAMUS
Draco.
The Dragon's-Blood.

CANES.

on this subject, once existed at Oratava in Tenerife, but it was unfortunately destroyed in the hurricane of 1867. The dragon's-blood afforded by this plant is met with as a secretion at the base of the leaves. A similar red gum is also said to be obtained from *Pterocarpus Draco*, a tree of the West Indies and South America, and also from *Croton Draco*, *Schlecht*.

Varnish
70

The various forms of Dragon's-blood are used in varnishing and staining wood. The substance is chiefly judged by the dealers according to colour and the high percentage of resinous matter soluble in alcohol. It is of inferior quality when it gives a dull brick-red mark when rubbed on paper, or has an earthy look on fracture.

MEDICINE.
71

Medicine—**DRAGON'S-BLOOD**—In the first mention we have of this drug it is spoken of as exported to the East from Arabia and Socotra. Ibn Batuta makes no mention of it as found in 1325 and 1349 in Java and S. Malacca. Perhaps it is a tree which grows in the latter of these countries.

Dragon's-blood of the ancients was a resinous extract from the stem of a *Dracæna*, and thus to have been a substance now treated as false Dragon's-blood.

chiefly used as a colouring agent for plasters and tooth-powders.

SPECIAL OPINIONS—§ "*Dracæna schizantha*, *Baker*, yields Zanzibar Dragon's-blood; and *D. Cinnabari*, Socotran Dragon's-blood." (*Surgeon-Major W. Dymock, Bombay*.)

"The Burmese *Kyeng-ni* produces a red exudation like Dragon's-blood. Dr. Mason presumes this to be *C. Draco*" (*J. C. Hardinge, Rangoon*.)

§ "Astringent, used as a dressing for ulcers." (*Surgeon W. Barren, Bluff, Cutch*.)

72

Chemical Composition.—"Dragon's-blood is a peculiar resin, which, according to Johnston, answers to the formula $C_{20}H_{20}O_4$. By heating acid liquid is obtained, together with a burning taste and crystals of a product has not yet been identified. It is soluble in acetone, *Toluol*, C_6H_6 , $(CH_2)_2$, *Styrol*, C_8H_8 (*Draconyl*), has to the existence in the drug of both these hydrocarbons are

lighter than water, yet we find that the above oily portion yielded by dry distillation sinks in water—a circumstance possibly occasioned by the presence of benzoic alcohol, $C_6H_5(CH_2OH)$.

C. 72

The Rattan.

CALAMUS
fasciculatus.

CANES.

"As benzoic acid is freely soluble - - - - - removed from the drug by that solvent got traces of an amorphous red matter nothing crystalline. Cinnamic acid, on the other hand, is always present, according to Hirschsohn (1877) As to the watery liquid, it assumes a blue colour on addition of perchloride of iron, whence it would appear to be - - - - - her than pyrocatechin."

with nitric acid, benzoic, nitro-benzoic, stained, and only very little picric acid the drug with caustic potash, and found

have shown that none of the forms of Dragon's-blood which they examined contained benzoic acid. They, however, found cinnamic acid in the resins of *Calamus Draco* and of *Dracæna Cinnabari*. They presume that the error of supposing the presence of benzoic acid arose through confounding it with cinnamic acid or possibly from working with a resin in which benzoic acid had been formed by partial oxidation. They established the chemical characters of four kinds of dragon's-blood, the origins of two of which were authentic, namely—

Dragon's-blood from Calamus Draco.—Is of a brick-red colour, melts at 80° C., giving off highly irritating fumes; is insoluble or nearly so in cold caustic soda, ammonia, lime water, and sodium carbonate, but dissolves when boiled in these reagents. It may be represented by the formula $C_{11}H_{13}O_4$.

Dragon's-blood from Dracæna Cinnabari.—Is vermilion-coloured, melts at 80° C., giving off aromatic irritating fumes, is readily soluble in cold caustic soda, ammonia, lime-water, and sodium carbonate. It may be represented by the formula $C_{11}H_{13}O_4$ (*Pharm Journ*, 1883) This is probably the true *dam-ul-akhsain* of the Arabs, it occurs in tears covered with a dull-red powder.

Calamus erectus, Roxb, Fl. Ind., Ed. C.B.C., 719

73

Vern.—*Sungotta*, SYLHET, *Theing, thaing*, BURM.

References.—*Kurs, For Fl, Burm, II*, 516, *Gamble, Man Timb*, 423, *Drury's Useful Plants of India*, 97, *Balfour, Cyclop*

Habitat.—An erect cane found in Sylhet, Chittagong, and Pegu.

Food.—It is said that in Sylhet the poor classes use the seed of this cane as a substitute for betel-nut.

FOOD

74

C. extensus, Roxb, Fl. Ind., Ed. C.B.C., 720.

75

Vern.—*Dengullar*, SYLHET, *Nelapoka*, TEL.

References.—*Gamble, Man Timb*, 424; *Drury's U P of India*, 96.

Habitat.—Met with in Sylhet, and said to often attain a length of 600 and Manipur Hills for

FOOD

76

77

C. fasciculatus, Roxb, Fl. Ind., Ed. C.B.C., 721.

Vern.—*Bara bet*, BENG, *Perambu*, MALA, TAM; *Amla, velasawmu*, TEL; *Dutt* gives *Ambutefasa* f (= rattan growing in water) SANS, but Dr Ch Rice informs the author that this determination is incorrect,

CALAMUS
hypoleucus.

The Rattan.

CANES.

and that the Sanskrit name of this species is more likely to be *Vetra*; *Kyringkha*, *Kyunka*, *Burm.*

References.—*Griffith, Fl. 195, A. & B.*; *Brandis, For. Fl.*, 552; *Gamble, Man. Timb.*, 423; *Kurz, For. Fl., Burm.*, 517; *Balfour, Cyclop.*; *U. C. Dutt, Mat., Med., Hind.*, 250.

Habitat.—Met with on the plains and hills of Bengal, Orissa, Chittagong, and the Andaman Islands.

DOMESTIC.
78

is by the direction of its spinous margins and keels than those of other species.

79 *Calamus flagellum*, *Griff.*; *Gamble, Man. Timb.*, 423.

Vern.—*Rohi bet*, NEPAL; *Reem*, *Lercha*; *Nagagola bet*, ASS.

Habitat.—Met with in Sikkim and Assam.

80 *C. floribundus*, *Griff.*, *Pl. exccii.*; *Gamble, Man. Timb.*, 423.

Habitat.—Met with in Upper Assam.

81 *C. gracilis*, *Roxb., Fl., Ed. C.B.C.*, 721.

Vern.—*Mapari bet*, BENG.; *Krapang*, *MAOH*; *Hundi bet*, ASS.

References.—*Griffith, Pl. exccii.*; *Gamble, Man. Timb.*, 423; *Drury, Useful Plants of India*, 57; *Kurz, For. Fl., Burm.*, 520; *Thwaites, En. Ceylon Pl.*, 330; *Balfour, Cyclop.*

Habitat.—Met with in Assam, Chittagong, and South Ceylon.

82 *C. grandis*, *Griff.*, *Pl. ccx.*; *Gamble, Man. Timb.*, 424; *Kurz, II.*, 523.

Syn.—*DEMONOROPS GRANDIS*, *Kurz (Enum., 30)*.

Vern.—*Rolang sumambo*, *rolang chry*, MALACCA.

Habitat.—Met with in Malacca and the Andaman Islands; stem about 2 inches in diameter.

83 *C. Guruba*, *Mart.*

Vern.—*Kyung-nee*, *Kyinnu*, *BURM.*

References.—*Gamble, Man. Timb.*, 424; *Kurz, For. Fl., Burm.*, 522.

Habitat.—Met with in Chittagong and Burma.

84 *C. Hefserianus*, *Kurz, ii.*, 521 (*Enum.*, 39); *Gamble*, 424.

Habitat.—Met with in Tenasserim or the Andamans.

85 *C. humilis*, *Roxb., Fl. Ind., Ed. C.B.C.*, 719.

Reference.—*Gamble, Man. Timb.*, 423.

Habitat.—An erect cane of Chittagong.

86 *C. hypoleucus*, *Kurz, For. Fl., Burm.*, II., 523.

Syn.—*DEMONOROPS HYPOLEUCUS*, *Kurz (Enum., 29)*.

Reference.—*Gamble, Man. Timb.*, 424.

Habitat.—Met with in Tenasserim.

The Rattan.

CALAMUS
Mastersianus.

	CANES. 87
<p>Calamus inermis, <i>T. And.</i> ; <i>Gamble, Man. Timb.</i>, 424. Vern.—<i>Dangri bet</i>, NEPAL ; <i>Brool</i>, LEPCHA. Habitat.—Frequent in Sikkim and Bhutân. Furnishes the finest alpen-stocks.</p>	
<p>C. Jenkinsianus, <i>Griff., Pl. clxxxvi. A., fig. 3</i> ; <i>Gamble, Man. Timb.</i>, 424, & xxx. Syn.—<i>CYMBOSPATHES JENKINSIANUS</i>, <i>Gamble</i>. Vern.—<i>Gola bet</i>, Ass ; <i>Gallah</i>, CACHAR. Habitat.—Met with in the Sikkim Terai, the Duars, and Assam.</p>	88
<p>C. latifolius, <i>Roxb., Fl. Ind., Ed. C.B.C.</i>, 719 Vern.—<i>Korak bet</i>, CHITTAGONG ; <i>Sain</i>, MAGH. ; <i>Ya-ma-ta</i>, BURM. References.—<i>Griffith, Palms, Br. Ind.</i>, 68, <i>Pl. cxcviii</i> ; <i>Brandis, For. Fl.</i>, 560 ; <i>Gamble, Man. Timb.</i>, 423, 424 ; <i>Kurz, For. Fl., Burm.</i>, 518. Habitat.—Met with in Chittagong, Burma, and the Andamans. Structure of the Wood.—This cane is much used in Burma for tying timber in rafts, and making the cables which stretch across the river at the Salween rope station. An immense chamber, with the stems about as thick as a walking-cane.</p>	89
<p>C. leptospadix, <i>Griff., Pl. lxxciv. A.</i> ; <i>Gamble, Man. Timb.</i>, 423. Vern.—<i>Dangri bet</i>, NEPAL ; <i>Lat</i>, LEPCHA. Habitat.—Found in Sikkim and the Khâsia Hills.</p>	90
<p>C. longipes, <i>Griff., cccii. A & B.</i> ; <i>Gamble, Man. Timb.</i>, 424 Vern.—<i>Gola bet</i>, SUNDERBUNDS Habitat.—Dr. King has identified this plant, proving the existence in India of a species hitherto supposed to be confined to Malacca.</p>	91
<p>C. longisetus, <i>Griff., Palms, Br. Ind.</i>, 44, <i>Pl. clxxxix. A.</i> ; <i>Thwaites, En Ceylon, Pl.</i> 330 Habitat.—An erect palm, very much resembling <i>C. arborescens</i> ; met with in Pegu and Ceylon</p>	92
<p>C. macracanthus, <i>T. And.</i> ; <i>Gamble, Man. Timb.</i>, 424. Vern.—<i>Phekori bet</i>, NEPAL ; <i>Ruebee, green</i>, LEPCHA.</p>	93
<p>C. macrocarpus, <i>Griff., Pl. clxxx VI. A., figs 1 & 2</i> ; <i>Gamble, Man. Timb.</i>, 423. Syn.—<i>C. ERECTUS</i>, <i>Roxb</i> Habitat.—An erect cane, met with in the Bhutân Duars.</p>	94
<p>C. Mastersianus, <i>Griff., Pl. ccvi.</i> ; <i>Gamble, Man. Timb.</i>, 424. Syn.—<i>C. GURUBA</i>, <i>Kurz</i>. Vern.—<i>Sui di-bet</i>, <i>quabi bet</i>, Ass. Habitat.—Met with in Assam, and, according to Griffith, is the smallest cane in Assam, being less than half an inch in diameter</p>	95

CALAMUS Rotang.	The Rattan.
CANES. 97	<i>Calamus mishmiensis</i> , Griff.; Gamble, <i>Man. Timb.</i> , 423. Habitat.—Met with in the Mishmi Hills.
98	<i>C. montanus</i> , T. And.; Gamble, <i>Man. Timb.</i> , 424. Vern.—Gouri-bet, NEPAL; Rue, LEPCHA. Habitat.—Found in Sikkim and Bhután. Yields the best cane for suspension-bridges; used also in Sikkim for dragging logs.
99	<i>C. nutantiflorus</i> , Griff., <i>Pl. cviii.</i> ; Gamble, <i>Man. Timb.</i> , 424. Habitat.—Met with in Assam.
100	<i>C. palustris</i> , Griff. Syn.— <i>C. LATIFOLIUS</i> , Kurz, <i>ii.</i> , 518 (<i>Enum.</i> , 34). Habitat.—Met with in Mergui.
101	<i>C. paradoxus</i> , Kurz, <i>ii.</i> , 521 (<i>Enum.</i> , 40). Reference.—Gamble, <i>Man. Timb.</i> , 424. Habitat.—Met with in Martaban.
102	<i>C. polygamus</i> , Roxb., <i>Fl. Ind.</i> , Ed. C.B.C., 721. Vern.—Hádám, CHITTAONG. Reference.—Gamble, <i>Man. Timb.</i> , 423. Habitat.—Met with in Chittagong.
103	<i>C. quinquenervius</i> , Roxb., <i>Fl. Ind.</i> , Ed. C.B.C., 720. Vern.—Hurnur-gullar, SYLHET. Reference.—Gamble, <i>Man. Timb.</i> , 424. Habitat.—Met with in Sylhet.
104	<i>C. Rotang</i> , Linn. (<i>in part</i>); Roxb., <i>Fl. Ind.</i> , Ed. C.B.C., 720. THE RATTAN CANE. Syn.— <i>C. ROXBURGHII</i> , Griff. It seems probable that <i>C. Rotang</i> , Linn., included originally more than one species: following Martius it is desirable, therefore, to retain the name as restricted to this species. <i>C. Rotang</i> , Willd., as in Roxb., <i>Flora India</i> , is the plant here described. He presumed that the Indian form was the same as Linnæus' Rotang. Vr The generic name in Ceylon for Calamus is waiwel, SINGH. References.—Griffith, <i>Pl. cxii.</i> ; B. J. P. F. . . . <i>Timb.</i> , 423; U. C. Dutt, <i>Mat. Med. Drugs</i> , 146; Drury's <i>Us. Pl.</i> , 56; <i>Dispens.</i> , 15th Ed., 1636; Balfour, <i>Ec.</i> Habitat.—Met with in Bengal, Assam, South India, Burma, and in the hotter parts of Ceylon. It delights in rich, moist soil, where there are bushes and trees for it to climb on. (Roxb.) It flowers at the beginning of the rains and ripens during the cold season.
C. 104	

The Rattan.	CALAMUS tenuis.
<p>Fibre—This is the species which yields the best and stoutest rattan canes of commerce. Other species are, however, used as substitutes. It is split into strips and platted or woven into baskets, chairs, sofas, and carriages. It is made into ropes, or is stretched entire across rivers, as the main supports of cane suspension-bridges. For further information see CANES.</p>	<p>CANES FIBRE. 105</p>
<p>Food—It flowers during the rains, and the fruit, which ripens in the cold season, consists of a fleshy substance surrounding the seed. This fleshy substance is eaten by the natives, who also eat the young tender shoots, regarding them as a delicacy.</p>	<p>FOOD 106</p>
<p>Calamus Roxburghii, Griff, <i>Palms, Br Ind</i>, 55, Pl cxii Syn—C. ROTANG, Roxb (non Linn) <i>Fl Ind</i>, 720, <i>Thwaites, En Ceylon Fl</i>, 330 See C. Rotang, Linn, above.</p>	<p>107</p>
<p>C. Royleanus, Griff, Pl cxii Syn—C. ROTANG Linn in part References—Brandis, <i>For Fl</i>, 559 <i>Gamble Man Timb</i>, 423 <i>Drury, Us Pl</i> 67 Habitat—Met with in Dehra Dun and in Northern Bengal</p>	<p>108</p>
<p>C. rudentum, Lour Vern—<i>Mā waiwet</i>, SINGH References—Roxb, <i>Fl Ind</i>, Ed C.B.C., 719 Habitat—A native of the Malaya and of Ceylon Fibre—Dr Trimen writes that this species is used by the people of Ceylon for ropes. "It is split into strings and used for plating beds, chairs, baskets. Long rattans are also employed for bridges across streams and rivulets."</p>	<p>109</p> <p>FIBRE. 110</p>
<p>C. schizospathus, Griff; <i>Gamble, Man Timb</i>, 423 Vern—Rong, LEPCHIA Habitat—An erect cane, native of Sikkim and the Khasia Hills Structure of the Wood—Stem about 2 inches in diameter, with hard wood and closely packed fibro-vascular bundles</p>	<p>111</p> <p>TIMBER. 112</p>
<p>C. Scipionum, Lour, Brandis <i>For Fl</i>, 560 THE MALACCA CANE (See also under CANES) Habitat—A native of Sumatra and Cochinchina. The canes are largely imported into India, after having been smoked a process which gives them their beautiful brown colour</p>	<p>113</p>
<p>Calamus, sweet, see <i>Andropogon Schoenanthus</i>, A. 1117</p>	
<p>C. tenuis, Roxb., <i>Fl Ind</i>, Ed C.B.C., 721 Syn—C. MONOICUS, Roxb, <i>Fl Ind</i>, Ed C.B.C., 721 Vern—<i>Pandhars bet</i>, CHITTAGONG; <i>Aring</i>, MACH; <i>Jals bet</i>, ASS.; <i>Jals</i>, CACHAR References—Griffith, <i>Pl exim A. P. & C.</i>, Brandis <i>For Fl</i>, 559 <i>Gamble, Man Timb</i>, 413, & 423, <i>Lour, For Fl</i>, <i>Drury, Us Pl</i>, 67 Habitat—A monocious climbing cane, met with in Assam, Sylhet, Chittagong, Pegu, and in the hotter parts of Ceylon</p>	<p>114</p> <p>C. 114</p>

CALF-SKINS.

Calf-skins.

- 115 *Calamus tigrinus*, Kurz, *For. Fl. Burm.*, 519.
 Vern.—*Leme*, BURM ; *Amdah*, AND.
 Reference.—*Gamble, Man. Tsm*, 424.
 Habitat.—Found in Burma and the Andamans.

The Vernacular names given to Canes sent to the Paris Exhibition, the scientific names of which have not been determined.

Persons who have the opportunity of doing so may find it possible to g with leaves and fruits so as

jayat and golak; the first is

CALAVANCE.

- 116 *Calavance*.—Oolonel Yule tells us that this name was once in common use in English, and may, perhaps, to this day be used at sea for a kind of bean, perhaps the Indian *Vigna Catang*, or a species of *Phaseolus*. The word comes from the Spanish *garbanos*, which DeCandolle says is the Castilian name for *Cicer arctium* (gram). See *DeCandolle's Origin Cult. Plants*, p. 323.

Calcium, see under Lime; also Marble and Limestone.

CALENDULA, Linn., *Gen. Pl.*, II, 454.

- 117 *Calendula officinalis*, Linn.; *Fl. Br. Ind.*, III., 357; *Bol. Mag.*, I. 3204; COMPOSITÆ.

MARIGOLD.

Vern.—*Aklel-ul-mulk*, *sergul*, *saldbargh*, PB ; *Htat-la-ya*, BURM.

"*Aklel-ul-mulk* is *Astragalus hamosus*, a leguminous plant." (*Assistant Surgeon Sakharam Arjun Ravat, L.M., Girgaum, Bombay*)

References.—*Stewart, Panjáb Plants*, 123. *Balfour, Cyclop.*

Habitat.—Found in the fields of the Panjáb and Sind, scarcely indigenous, Peshawar. (*Aitchison*) Stewart says it is called *sergul* in the Trans-Indus tracts, where it is "common, wild in some parts."

DYE. 118 Dye.—An extract of the flowers is, by Bellew, said to be used to colour butter and cheese. It is probable that some of the properties assigned to this plant should more correctly be attributed to the *genda*, *Tagetes patula*. Both plants are used as dyes and are often mistaken the one for the other.

OIL. 119 Oil.—Baden Powell, in his *Panjáb Products*, mentions this as an oil-yielding plant. The oil is said to be used for medicinal purposes.

FODDER. 120 Fodder.—Bellew mentions the belief that when browsed on by cows, this plant is supposed to increase the flow of milk.

Calf-skins, see HIDES AND SKINS

Calicos or Calicut Cotton Goods.

CALICO.

CALICO.

121

Calico. Cotton cloth originally made at Calicut.

Vern.—*Kapra*, HINDO.; *Tunt*, TAM.; *Gudha*, TEL.; *Kapin-kapas*, MALAY.

The earlier writers speak of the cotton fabrics of India as "linens." When introduced to modern Europe they received the name of Calicos, after the town of Calicut, in the Madras Presidency, where they were then extensively made. At first the use of cotton fabrics was prohibited in England, the downfall of the trade in woollen goods being anticipated from the introduction of these cheaper textiles. Soon, however, this opposition was removed; but instead of the centres of woollen manufacture be-

cotton manufacture been attempted in the more midland and eastern counties of England, it may be doubted how far the unprecedented success which rapidly ensued could have occurred. The time-honoured handlooms of India had been the delicate and beautiful

year by year, was made of the Indian weaver of the world migrated from India to Lancashire. The exports from India, which once alarmed the British manufacturer, came to a sudden end. The tide turned, and wave by wave the imports from Great Britain increased until the cotton piece goods and yarns of Lancashire took complete possession of the Indian market. India no longer exports cotton goods and yarns.

But indications are is feared over-competition has in Europe given birth in many cases to a depreciated article, and not in India only has the outcry gone forth against the weighted and starched piece goods which now leave the shores of Europe for the foreign markets. This want of confidence has recalled into new existence the hand-looms of India, and the weavers using the European yarns are now turning out an article which, it is admitted on all hands, may be less elegantly finished but is certainly not inferior in quality to the imported piece goods. This demand for yarns has enabled first one then another cotton mill to spring into life and activity. There are now cotton mills scattered all over India, keenly competing not in the yarn trade only, but in the piece goods as well, and last

saving of two freights may yet work the same revolution in the cotton trade of India as has become an established principle in jute.

For further information see Cotton and Gossypium.

CALICOPTERIS.

122

Calicopteris floribunda, Lam.; *CONBRETACEÆ*.

Syl.—*GETONIA FLORIBUNDA*, Roxb., *Fl Ind.*, 11, 428.

Vern.—*Kokoranj*, C P, *Bands*, *murududu*, TEL.; *Marsada*, *bolu*, MYSORE.

CALOPHYLLUM
tomentosum

The Poon Spar

TIMBER.
153

Structure of the Wood—Similar to that of *C. spectabile*. Mr Ches-
ter of the Forest Department says it is used largely in Chittagong for
masts, spars, and rafters, and sometimes in small boat-building and canoes.
Weight from 38 to 40 lbs a cubic foot.

154

Calophyllum spectabile, Willd., Fl Br Ind, I, 271, Wight, Ic,
I 128 & III

Syn—*C. MOONII*, Wight, *C. ANGENUM*, Wall, *C. TETRAPETALUM*, Roxb
Vern—*Panta ka, kyandoo*, BURM, *Dakar talada*, AND, said to be known
as *Lal chuni* in HIND

References—Roxb., Fl Ind, Ed C B C, 438, Kura, For Fl Burm, I,
91, Gamble, Man Timb, 25, Thwaites, En Ceylon Pl, 52; Bedd, Fl
Sylt, XXII

Habitat—A tall evergreen tree of Tenasserim and the Andaman
Islands

TIMBER.
155

Structure of the Wood—Light red, shining, cross-grained, moderately
hard. Is used for masts and spars, also for planking, for which purpose
it has lately been employed in building barracks in the Andamans

156

C. tomentosum, Wight, Ic, I 110; Fl Br Ind, I, 274

THE POON SPAR, SIRPOON TREE

Syn—*C. ELATUM*, Beddome, XXII & I 2

Vern—*Pün sirpon* BOMB, *Pün püne, pungu MALA*, *Pongu, TAM*,
Siri püne kuce, surponne bobbi, KAN, *Nagani, MAR*, *Kina, SINGN*

References—Gamble, Man Timb, 26, Thwaites, En Ceylon Pl 51,
Dymock Mat Med, W Ind, 2nd Ed, 87; Drury, Us Pl, 98, Cooke,
Oils and Oil seeds 32, Lisboa, Us Pl of Bomb, 13; Spens, Encyclop,
1392 Balfour, Cyclop, Ed 1885, Treasury of Botany

Habitat—
feet, met with
southward, a

150
nara

Property and Uses—

GUM
157

Gum—Dr Dymock informs the writer that this tree yields a black
opaque gum, which, in the bazar, occurs much mixed with pieces of bark,
but is a pure and can be sold as a solid matter. The solution is

the solution becomes
f soda, throws down
apparently some of the brown colouring matter without interfering with
higher in
um in this
id restored
found that
at the violet
appears on
addition of

alkalies. The solution of the gum does not appear to rotate polarised light.
The gum itself communicates only a very faint fluorescence to rectified
spirit (Lyon). I am not aware of either of these gums having been
applied to any industrial or medicinal uses, but as they are collected by
the natives, it is probable that they are supposed by them to have some
medicinal virtues. (Dymock Mat Med, W Ind, 2nd Ed, 87-88)

abundance of oil known as Keena-
tel

that of *C. spectabile*. This tree
affords the Poon Spars of commerce, these are much used for masts, and

C. 159

OIL
158
TIMBER.
159

The Swallow-worts

CALOTROPIS

often fetch large prices. The timber is also used for building and bridge-work.

"A single tree has been known to realize more than £100 (R1,000)." (*Bomb Gas.*, XV., 64)

Calophyllum Walkeri, *Wight, Ic.*, t. 45; *Fl. Br., Ind.*, I., 275.

160

Syn.—*C. DECIPiens*, *Wight, Ill.*, I., 128.

References.—*Thwaites, En. Ceylon Pl.*, 51; *Cooke, Oils and Oil-seeds*, 32; *Balfour, Cyclop.*

Habitat.—A large tree, found in South India and Ceylon.

Oil.—The seeds yield an oil, used for burning.

OIL.

161

C. Wightianum, *Wall*; *Fl. Br. Ind.*, I., 274; *Beddome, Flora Sylhet*, t. 90; *Wight's Ill.*, I., 128, also *Ic.*, t. 106.

162

Syn.—*C. SPURIUM*, *Chois.*, and of *Drury, Us Pl*; *C. DECIPiens*, *Wight, Ic.*, t. 106 (not of *Thwaites*)

Vern.—*Kalpan*, *kull-pannul*, *bobbi*, *KAN*; *Cheru pinnay*, *palengi*, *TAM*.

Cooke, Gums and Gum-resins, 109; *Cooke, Oils and Oil-seeds*, 33, *Lisboa, Us Pl of Bomb.*, 12, 314; *Sponz, Encyclop.*, 1379, 1387, 1624, 1683, 2020, 2021; *Balfour, Cyclop.*, Ed. 1885; *Treasury of Botany*

Habitat.—An evergreen tree of the Western Ghâts, from the Konkan to Travancore.

Gum.—"The gum occurs in large, translucent, irregular lumps of a

GUM.

163

and becomes slightly viscid" (*Dymock, Mat. Med.*, IV Ind)

Oil.—The seeds yield an oil not differing very much from that of *C.*

OIL.

164

MEDICINE.

165

scabies and rheumatism

Food.—The fruit, when ripe, is red and sweet It is eaten by the natives (*Drury*)

FOOD.

166

Structure of the Wood.—Hard, red *Beddome* and also *Lisboa* say the timber is in *Kánara* much esteemed, and is valuable for engineering purposes

TIMBER.

167

Calosanthos indica, *Blume*, see *Oroxylon indicum*, *Vent.*, BIGNONIACEÆ.

CALOTROPIS, *R. Br.*; *Gen. Pl.*, II., 754.

168

THE SWALLOW-WORTS

Species, these are inhabit-

Leaves opposite, broad,
or sub-racemose cymes
S. fleshy, laterally com-

C. 168

Madár Gutta-percha.

CALOTROPIS
gigantea.

Mir Muhammad Husaln notices three kinds,—1st, a large form with white flowers, large leaves, and much milky juice, found near towns; 2nd, a form with smaller leaves and flowers, white on the outside but lilac within; and 3rd, a still smaller kind with pale greenish-yellow flowers (*Dymock*). The 1st and 2nd are most probably forms of *C. gigantea*, and the 3rd, *C. procera*.

GUTTA-
PERCHA.

Calotropis gigantea. Robert Brown subsequently showed that it was incorrect to refer this plant to *Asclepias*, and he accordingly founded the genus *Calotropis*,—a genus which embraces, as far as at present known, two or probably three species. *C. procera* was first described from a specimen collected in Egypt by Prosper Alpinus (1580-84), and figured by him on his return to Italy (*De Plantis Aegypti*, 1592). It is also the *Apocynum syriacum* figured by Clusius. (*Flück. & Hanb., Pharmacog.*)

The drug prepared from one or other of these species was apparently well known to the Arabians. Ibn Baytar (*Sonthheimer's translation in 1842*) describes the drug. Muhammadan writers at the present day refer to it under its Arabic name *Ushar*, in Persian it is known as *Khark*. The medicinal properties were first made known to Europe in 1826.

A tradition of Oomarcote narrates that the great Emperor Akbar was born under an *Ak* bush; hence his name. (*Birdwood*). The word *bar* is applied to the liquor said to be prepared from *Ak* juice.

Properties and Uses—

The SAP yields a form of Gutta-percha; it is also used as a TAN and DYE. A MANNA is said to exude from the plant, the bast FIBRE and FLOSS from the seeds are well-known fibres; the ROOT bark and SAP are

the
plant are

THE MILKY SAP—A SOURCE OF GUTTA-PERCHA.

MILKY SAP.
Gutta-percha.

171

the other, it has been thought advisable to give in one place a compilation of the entire literature. It is probable, however, that Dr. Riddell's experiments were entirely conducted with *C. procera* and not with *C. gigantea*.

The inspissated and sun-dried milky sap from the stem constitutes the

the first instance, by Captain (since Colonel) Meadows Taylor in a letter to the Secretary, Agri-Horticultural Society of India, Vol. VIII. Afterwards Dr. Riddell republished his discovery in *The Bombay Times* in 1852. As these letters may not be accessible to persons likely to be

C. 171

CALOTROPIS
gigantea.
The Swallow-worts.
**GUTTA-
PERCHA.**

interested by this subject, the more important parts narrating the actual experiments are quoted below:—

"The process of boiling the juice in water, and then pressing it between the finger and thumb, is a process which serves to remove all the solid property of the juice, as also all other matter but the gutta-percha itself. It is believed that the more it is boiled and worked up, the harder it will eventually become when cool.

"The process of boiling the juice in water, and then pressing it between the finger and thumb, is a process which serves to remove all the solid property of the juice, as also all other matter but the gutta-percha itself. It is believed that the more it is boiled and worked up, the harder it will eventually become when cool.

water with a wooden kneader, or boiled, until process serves to remove all solid property of the juice, as also all other matter but the gutta-percha itself. It is believed that the more it is boiled and worked up, the harder it will eventually become when cool.

"Spirit of turpentine—dissolves it into a viscous glue which, when taken up between the finger and thumb, pressed together, and then separated, shows numberless minute and separate threads.

"The above chemical tests correspond exactly with the established results of the real gutta-percha.

"The substance, however hard it may have become, becomes immediately flexible in hot water, and readily takes any form required, receiving and retaining impressions of seals, ornaments, &c. It has been made into small cups and other vessels which are not found to alter in form.

Dr. Riddell subsequently wrote:—

"As regards my experiments with the 'muddar' juice, they are as follows: Having collected about 18 fluid ounces, I had it strained through a cloth, and exposed 13½ ounces of it to solar evaporation on a flat dish. In three days it became firm, separating itself from the dish and easily removed. I then placed it in boiling water,

Madár Gutta-percha.

CALOTROPIS
gigantea.GUTTA-
PERCHA

Mr. Liotard publishes, in his "Memorandum on the materials in India suitable for the Manufacture of Paper," the opinion of Professor Redwood upon Madár-gutta. The Professor considers it possesses many properties in common with Gutta-percha of commerce. The specimen so reported on was collected by Captain G. E. Hollings, Deputy Commissioner, Shahpur (in the Panjáb) in the year 1853, little more than one year after

MADAR-
ALBAN.
172

mercial importance.^b (Colonel D. G. Pitcher, Lucknow.) Dr. Duncan in 1829 discovered in Madár-gutta a substance which he called *Mudarine*. This was said to have the property of coagulating by heat and becoming again fluid with cold. This statement has never been confirmed, but Dr. Warden published, in 1885, his discovery of a white crystalline mass closely resembling the substance named *Alban* by Payen. This Dr. Warden named *madár-alban*. A yellow resin associated with the *madár-alban* was found to agree with Payen's *Fluavol* as found in true gutta-percha. Speaking of these discoveries Dr. Dymock says "The fact that the sap of the *madár* plant contains, in addition to caoutchouc, two

the Drug)

A Varnish-like Exudation.—Some time ago the writer observed the *dk* plants in Chutia Nagpur completely covered with multitudes of small green insects. The bushes did not look over-healthy, and (apparently as a result of the action of the insects) a gummy liquid exuded from them and trickled down to the ground below. The writer was travelling in company with Sir Monier Williams and one or two other gentlemen, so that this curious discovery was investigated by several persons, none of whom had ever observed the peculiarity alluded to before, although many years resident in the district. We were crossing the dry sandy basin of the Upper Barákar, and our attention was drawn to this curious fact by the ground under the bushes appearing wet. Stones were picked up but found to be quite dry, although completely varnished with the liquid falling from the bushes. The author is not aware of this varnish-like exudation having been recorded before, but unfortunately was unable to investigate its chemical nature. May it not, however, be in some way connected with the excretion of manna described by Arabian and Persian writers? (See page 47)

VARNISH.
173

Bast Fibre.

CALOTROPIS
gigantea.

The Floss as a Paper-Fibre.—Using this silk-cotton as a paper would be far too expensive to the province could supply sufficient for more than a few days, and preclude the possibility of a price likely to be quite otherwise remunerative. It seems every reason to account, its cul stem is one of the best from the sap, and at the present day.

FIBRE.
Floss.
176

The Bark Fibre.—The bark of the tree is cut into strips, and the inner part is separated from the outer. The strips are then twisted into a twine by rubbing them between the hands. No water is used (indeed, is injurious); everything is done by manipulation. In a subsequent paper Captain (afterwards in other reports Major) Hollings observes that the best plan is to select the straightest branches, which are cut at least 24 hours before any attempt is made to separate the bark. On the second or third day the sticks are broken, which ensures the bark, with its length; they then hold the tissue of threads in one hand and separate the bark with the other. He did not find that any of the ordinary

Bark.
177

Captain Hollings states that the sticks of the Madár were cut about 12 or 18 inches in length; the outer bark was then carefully peeled off, and the fibre picked from the inner part of it. Several threads were then placed side by side, and twisted into a twine by rubbing them between the hands. No water is used (indeed, is injurious); everything is done by manipulation. In a subsequent paper Captain (afterwards in other reports Major) Hollings observes that the best plan is to select the straightest branches, which are cut at least 24 hours before any attempt is made to separate the bark. On the second or third day the sticks are broken, which ensures the bark, with its length; they then hold the tissue of threads in one hand and separate the bark with the other. He did not find that any of the ordinary

nearly forty years ago), very little has been done to extend our knowledge of the separation and examination of the bast fibre.

Liottard with the following note re the separation and examination of Indian fibres, and more particularly the opinion he has now arrived at regarding madár bast fibre:—

"In the autumn of 1884, while testing different machines in their power of extracting the fibres of various fibre-yielding plants, I devoted attention to the ákunda or madár amongst other plants. I had already studied this shrub previously, to a certain extent, and had formed a hope-

CALOTROPIS
gigantea.

The Swallow-worts

FIBRE

ful idea of it. But the trials just alluded to have induced me to alter considerably my previous opinion. I can now confidently state that the hopes expressed by previous writers, and by myself, that the *madar* would be one of the best fibre-producers of this country, will never be realized. Its fibre is certainly fine, strong, white, and silky, and could it wholely be extracted in a merchantable condition (though none of the machines tested by me produced any good results with it); but the obstacles to its profitable utilisation on a large scale outweigh its natural good qualities.

Without entering into many details, I may mention two of the chief obstacles.—

"(1) the very small proportion of the fibre to weight of the stems, the proportion being only 1/50 per cent; and

"(2) the shortness of the fibres, extending as they usually do from joint to joint, the joints being from 3 to 6 inches apart.

"These two chief obstacles are sufficient to justify a withdrawal of the *madar* from the list of hopeful fibre-bearing plants of India. I have been considering the fibre in connection with textiles and strings; and it follows that it would be still less suited as a material for making paper, for in the manufacture of paper a material is required which, besides possessing tenacity, fineness, and purity, has also the advantage of cheapness. *Madar*, owing to its very small proportion of fibre, and to the presence of a milk of a dangerous nature (both of which facts must necessarily raise the cost of extraction of the fibre), can never be utilised profitably as a paper material to any extent, and should, in my opinion, be considered as one of the last materials to which a paper manufacturer would have recourse."

A verdict so decisive and pronounced by a gentleman who has devoted much time to the study of Indian fibres should be guarded with caution, but opinions differ very considerably as to the prospects of *madar* bast fibre becoming of commercial importance. The attempts made by manufacturers hitherto would seem not to have been conducted on a sufficiently extended scale to justify the expression of strong expectations or to dispel such hopes.

The recent experiments conducted by the author in conjunction with Mr. Cross of Lincoln's Inn, London, have revealed the fact that by nitrating the fibre a substance, which can scarcely be distinguished from silk, may be produced. This, in the first stage of its preparation, is an admirable gun-cotton, but its explosive nature may be destroyed without injuring the beauty of the texture. Under chemical treatment the fibre behaves admirably, and with different reagents various results are obtained, but it may be concluded that the opinion we arrived at confirms the verdict already given that the mechanical difficulties are too great and the ultimate fibres too short to justify high hopes being entertained of *madar* bast fibre becoming of any great commercial importance, although its great beauty makes one resign it with regret.

Strength of *Madar*.—The comparative strength of *madar* fibre has been repeatedly shown, and the following table contains the results of the experiments made by Dr Wight —

Name of the fibre.					Weight in lb the fibre can sustain
The fibre of	Cocos nucifera	.	.	.	224 lb
"	Hibiscus cannabinus	.	.	.	290 "
"	Sansiviera zeylanica	.	.	.	316 "
"	Gossypium herbaceum	.	.	.	346 "
"	Agave americana	.	.	.	362 "
"	Crotalaria juncea	.	.	.	407 "
"	Calotropis gigantea	.	.	.	552 "

Cultivation of Madar.

CALOTROPIS
gigantea

Of the fibres experimented with by Wight, the *madar* was by far the strongest.

Madar bast fibre as a paper material.—Mr. G. W. Strettell, of the Forest Department, in his *New Source of Revenue for India*, states that the madar should "afford a material for paper as good as, and cheaper than

PAPER.
179

of
of
difficulty of extraction. In the *New Report for 1881*, however, an opinion is expressed by Mr. Routledge quite opposed to this, he believes that "neither it (*madar*) nor any other exogenous plant of similar character can ever compete with Esparto, nor be produced at a sufficiently low cost to admit of its being employed as paper-making material." With Esparto selling at £4 a ton, landed in London, it is hopeless to look to this (or indeed to any fibre which requires to be prepared) to ever become an article of export trade for the English paper market. It may, however, come to be of some use as an Indian paper fibre. Paper is reported to be in fact prepared from it in the following districts Bellary in Madras, and Furruckabad and Meerut in the North Western Provinces [Colonel Pitcher throws doubt upon the accuracy of this last statement] The plant is abundant in the Panjáb, and, together with the next species, is there, to a small extent, made into paper

Cultivation of the Madar Plant for its Bast Fibre and Floss.—"It thrives

180

raised from seed, it is said by some to require two years before being ready for cutting, but if cut close to the ground, it grows again rapidly, yielding a second crop within 12 months from the first" (*Spons' Encyclop*)

Royle's account of this fibre is the most complete statement published.

anything less productive than dry sand, and yet the *madar* thrives on it. Should its cotton be found useful, the waste lands of India could be covered with it, as it requires no culture and no water. It comes to maturity in a year, but is perennial, when once planted or sown, it would require no further care, poor s-
root a

suggested that the *madar* should be used as a hedge to protect desert land brought under cultivation from the encroachment of drift sand. This would give a healthful impetus to the cultivation of the plant itself," (*Royle, Fibrous Plants*, 308) (*For further particulars see SAND-BINDING PLANTS*)

Since the above was set up in proof the author has had many opportunities, in connection with the late Colonial and Indian Exhibition, held in

CALOTROPIS gigantea.

The Swallow wort.

MEDICINE.

London, to discuss with respect to the properties of *mille folia*. A Lancashire apothecary stated that he had previously been informed that the plant offered by the above, and was prepared to purchase any quantity. Hence a well planted field over a wide area, the soil, soil, soil, and irrigated. The ground now as it is, will be fit to cultivate *mille folia*. The species referred to, and the above, are the same as the one, has placed a small sum of money in the hands of a Mr. Cameron in Calcutta Nagpur, and a few acres of land are experimentally being given under this new crop. The report, which, has been most encouraging, and the hope is even to find that, by careful selection of seed and a little extra attention in cultivation, the character of the plant may be changed and its length of staple improved. It is therefore confidently expected that very soon, and as a direct outcome of the Calcutta and India Exhibition, and a will commence to produce on a commercial scale the new textile fibre. Mr. Cameron of Mysore writes to the author that a demand has recently arisen for this plant, Messrs. Collyer & Co. of London offering 5s. a pound for it. This is nearly twice as much as was being paid during the Exhibition time for *Sesuvium* (see Bombay).

Medicinal Properties.

181

Chemical Properties.—Much difference of opinion still prevails regarding the relative medicinal values of *C. gigantea* and *C. peruviana*. Dr. Wright and with him the majority of authorities are decided in favour of the latter, but all agree that the difference consists only in degree. The active principle seems to reside in a peculiar bitter principle, but no alkaloid occurs in the drug. The able authors of the *Pharmacographia* carefully re-performed

duced colourless. Since the date of these experiments, Drs. Warden and Wright, of Calcutta, have re-performed the experiments, and the result of this is given in the *Pharmacographia* (see *Pharmacographia* and *Hamil's Chemistry*, XVII, 368). Further investigations, however, conducted by Dr. Warden, have revealed that this was not quite the case, since

Bark.
182

Hindû writers seem to prefer the root-bark, and Muhammadans the juice. The *Pharmacopœia* further directs that the roots should be collected in

Madár as a Drug.

CALOTROPIS
gigantea.

April and May from plants grown in sandy soil; after carefully washing, to remove all earth and sand, they should be allowed to slowly dry in the shade until the sap no more flows from incisions made in the bark. The bark should then be carefully removed, dried, and reduced to a powder, and preserved in well-corked bottles. Moodeen Sheriff adds that the roots from old are superior to those from young plants.

"The root-bark is said to promote the secretions, and to be useful in skin diseases, enlargements of the abdominal viscera, intestinal worms, cough, ascites, anasarca, &c. The milky juice is regarded as a drastic in combination with . . . are considered digest- . . . catarrh, and loss of appetite."

"The juice is so that the fu . . . with whey in a . . . root-bark, red . . . of the legs and scrotum. The milky juice of this plant and of *Euphorbia*

neriifolia are made into 'tents' with the powdered wood of *Berberis asiatica*, and introduced into sinuses and fistula in ano." (U. C. Dutt, *Mat. Med. of the Hindús*.)

According to Dr. Casanora, *madár* stimulates the capillaries and acts powerfully on the skin, and is accordingly recommended as a remedy in the obstinate cutaneous diseases of tropical climates, such as elephantiasis and leprosy.

The *Pharmacop* . . . cal opinions held r . . . are testified to by . . . Durand, Stewart, . . .

leprosy by Drs. Robinson, Playfair, Ross, Ainslie, Rogers, and Irvine. Its efficacy in *syphilitic affections* by Dr. Casanora, and in *dysentery* by Dr. Durand. In another paragraph will be found a most interesting series of medical opinions which have been specially communicated for this work, and which bring it abreast of the most recent researches with the properties and uses of *madár*.

Properties of the Juice or Milky Sap.—Ainslie, Moodeen Sheriff, and most other authors regard the juice as more powerful than the bark, but less valuable, owing to its being irregular in its action. Dymock says "the juice is described as a caustic, a purge for phlegm, depilatory, and the most acrid of all milky juices." (Compare this with the remarks further on, under the heading '*an alcoholic liquor said to be prepared from this sap*.')

Medicinally it is recommended for skin diseases, ringworm of . . . with honey, it is viewed as useful . . . outh, and a piece of cotton-wool . . . hollow tooth is reported to cure . . . ed, in his Commentary upon the

Tuhfat, strongly recommends it in leprosy, hepatic and splenic enlarge-

ment, and is to steep . . . The milk . . . c.; the fresh . . . Oil in which . . . powder of . . . the dried leaves is dusted upon wounds to destroy excessive granulation and promote healthy action." (Dymock.)

Roxburgh in his *Flora of India* gives the following account of the medicinal properties of this plant, from which it will be seen that nearly a century ago its properties were as well known to Europeans as they are

MEDICINE.
Root-bark.

183

Milky-Juice.

184

Flowers.

185

Leaves.

186

CALOTROPIS gigantea.

The Swallow words

MEDICINE.

at the present day. "A large quantity of an art milky juice flows from wounds made in every part of the tree, about which the natives apply it to various medicinal purposes besides which, they employ the plant itself and the preparation thereof to cure all kinds of fits, epilepsy, hysteria, Convulsions from Cerebral fever, and after labour, and Spasmodic disorders, such as the Laskjaw, Convulsions in children, Paralytic complaints, cold sweat, profuse perspiration, and venereal complaints."

SECRET DRINKING.—The writer is not to publish more than a very limited selection from the numerous opinions which have been favoured with regarding this drug. The plant in question is employed medicinally in every province, and is indeed one of the most extensively used drugs in India.

§ "The medicinal properties of *Calotropis gigantea* have been known to the natives of this country from the earliest period, and it is held in great esteem by the Hindî practitioners in the treatment of some venereal and skin diseases,—so much so, that it is called by some of them 'the vegetable mercury.' There are two varieties of this plant in Southern India,—one with blue or bluish-purple flowers, and the other with cream-white. Almost all the parts of *Calotropis gigantea* are used in medicine, but the dry milky juice, fresh flowers, and the root-bark are by far the best and most useful. In whatever way the milky juice is collected and dried, its smell and taste are the same, viz., rancid and unpleasant, but its colour and external appearance differ to a slight extent according to the method adopted for its collection. If it is collected in shallow earthen plates and dried under shade (which is the best way for the purpose), it is formed into thin layers, which, when quite dry, can be easily separated from the plates more or less entirely with a bolus knife, and are very brittle. The colour of these layers is grey or pale brown, but if the juice is collected and dried in a cup or deep vessel, it assumes the shape of the latter, and its colour is much deeper externally and paler internally. The dry juice is

in ether, horey, juice are brittle, sed for the purpose of reducing them into powder; they also become soft when exposed to the heat of the sun; the dry juice, therefore, can only be administered in the form of pills.

"The dry juice is an efficient antispasmodic, alterative, and nervine tonic. It is a very useful

should be selected from weather. The bark should be about 24 hours after with which the bark is with a knife before the prepared is white and nauseous and slightly at a corked bott

as possible, and as so thick, inert, to and

hot or dry is dug out, epidermis off Set it

Medical Opinions regarding Madár.

CALOTROPIS
gigantea.

MEDICINE.

one of the best substitutes for ipecacuanha in this country, and has been found useful in many of the diseases for which the latter is indicated,

Trisplicane, Madras)

The following abstract from a detailed account of the use of *madár* juice in the cure of snake-bite may be found interesting, this is the only instance, in a very extensive series of Medical opinions, in which *madár* is recommended for this purpose;—

"C"

be lessened and given every hour. In no case does it require more than nine doses to effect a cure. If the bitten person be unconscious and not able to

When c
food and
pill, reco.

Madras)

"It is a common sight in Oudh, of a morning, to see the people collecting the sap to be placed on a sore or skin disease" (*Colonel D. G. Pitcher, Lucknow*) [This may be seen all over India, but it is a remarkable fact, at the same time, that if placed on an open cut on the skin it causes great burning and produces a bad sore—*G. Watt*,

"The fresh juice is used with common salt in bruises and sprains, and the fresh leaves warmed are used as poultices in rheumatism, gout, and rheumatic antritis, to relieve painful joints. The juice is an irritant, and in large quantities an irritant poison" (*Brigade Surgeon F. H. Thornton, Monghyr*) "The dried bark may be considered a substitute for ipecacuanha, and used as such, but it is very inferior to that invaluable drug" (*Brigade Surgeon S. M. Shircore, Moorshedabad*) "The juice or milk of the plant is used as a rubefacient. In doses of from 5 to 10 grains with $\frac{1}{2}$ grain of opium given twice or three times a day, it proves as efficient as ipecacuanha in cases of dysentery. It produces great heat in the stomach, but is less liable than ipecacuanha to produce vomiting." (*Assistant Surgeon Farwant Rai, Mooltan*) "I have used powder of

gether, are found

Also half a seer

dium carbonate)

The patient will be cured in a week." (*Native Doctor Mr Comer Ali, Bhagnipur, Etawah*) "A decoction of the root is used by the Santals in infantile

CALOTROPIS
gigantea.

The Swallow-worts

MEDICINE.

"A valuable remedy with similar effects to ipecacuanha, but not so good. The bark of the root should be gathered in April. The dried juice is also of value" (*Assistant Surgeon Nepal Singh, Saharanpore*) "Fresh leaves and juice used in guinea worm as local application. Given externally, produces dryness of the throat and running from the eyes, nose, &c." (*Dr Dirasha Hormazji Baria, L M S, Bombay*) "Fifteen grains of the powdered root-bark, combined with a grain of opium, successfully used in acute dysentery. Milky juice from the flowering tops cures scabies rapidly" (*Assistant Surgeon Shib Chunder Bhattachary, Chanda,*

tion" (*Surgeon-Major J. Robb, Ahmedabad*) "A valuable remedy in

It has been
R D Mur-
in leprosy,
itism, intes-

tinal worms, mercurial cachexia, bronchitis, elephantiasis" (*Hospital Assistant Choona Lall, Jubbulpore*) "The dried and powdered pistils and stamens, in doses of 2 to 3 grains repeated hourly, useful in cholera. The vomiting is checked or moderated. The leaves are used as applications to rheumatic pruns" (*Narain Mistr, Hoshangabad, Central Provinces*) "The powdered root bark, smoked like tobacco, is used by native physicians in syphilis. The flower-buds, in doses of 5 grains, combined with black pepper and salt, are useful in dyspepsia with palpitation, and in cholera. In the latter disease they are used to check vomiting. The leaves are used as a local application in rheumatic affections" (*Hospital Assistant Lal Mahomed, Hoshangabad, Central Provinces*) "The bark is said to be useful for chronic rheumatism but I did not find it to be so" (*Surgeon-Major H J Haslett, Salem, Madras*) "Mixed with pepper the leaves are used in Mysore for cleaning the teeth. The milky juice is also used with salt to allay toothache" (*J Cameron, Mysore*) "Madar leaves are very useful in relieving pain and swelling due to the presence of guinea-worm, and also in other inflammatory swellings. The leaves are smeared with sweet-oil and then heated by holding near a fire, and applied one over the other until a dozen or more have been placed on the affected part" (*Surgeon G G Ward, Mhow*) "Is called 'Jilledo echettu' in Telugu. This is one of the articles used by natives to procure abortion. This is effected by brushing the mouth of the womb through the vagina with the milk or juice of the plant. Root-bark in powder or infusion or decoction is useful as an emmenagogue" (*Surgeon-Major F W Levinge, Ryamundry, Godavery District*) "The powdered root bark is much employed in the hospital in all obstinate forms of skin diseases and leprosy. It is a useful alterative, as an emetic also it acts well. In skin diseases it has been used in combination with Hydro-

bark of the root is a good substitute for ipecacuanha. The dried flowers are used in Mysore in from 1 to 2 grain doses, along with sugar, in leprosy, secondarily syphilis, and in gonorrhoea, with milk of it" (*Surgeon Major J. A. Fort, Mysore*) "The leaves, smeared with castor oil and heat-

Madār Manna.

CALOTROPIS
gigantea.

ed, are applied to the scrotum in epididymitis" (*Surgeon James McCloghry, Poona*) "The green leaves, tied in bundles and cut into halves, are used as a fomentation by heating the cut ends in a pot in which castor oil has been warmed; useful in rheumatic affections, and largely used by the natives." (*Honorary Surgeon P. Kinsley, Chicacole, Ganjam, Madras*) "The freshly-pounded root-bark is used by natives as an alternative, and the milky juice as a vesicant in rheumatism. In abscess of foot, the natives heat a brick and place half a dozen leaves over the

MEDICINE.

impetiginous. The flowers, mixed with powder, relieve pain in the heels. (*Surgeon John Lancaster, Chittore*)

It is probable that the above special medical opinions refer to both this in C. that species.

MADAR LIQUOR AND MANNA.

Food and Liquor.—The *M* is said by the Arabs and Persians to yield a sugar or manna: this fact is briefly alluded to by Royle (*Him Bot.*, 275) and by Birdwood, but definite information regarding this property does not appear to have been published. It may be doubted, if indeed produced from *Calotropis* in Persia, whether this excretion occurs in India at all. There are other instances of a plant producing a product in one country which it fails to do in another; witness *Cannabis sativa* for example. The manna said to be obtained from this plant is known in the bazars as *Sakkur-el-ushar*, and is said to be produced through the parasitic action of *Larinus ursus*.

§ "Most of the Arabian writers agree in describing a sugar or honey dew which is produced upon the plant, probably by an *Aphis* as suggested by Dr. Watt's observation in Chutia Nagpur. The different kinds of *Larinus* build nests or cocoons (on various species of *Echinops*) which contain sugar, e.g., the Persian *Shakar-i-tighal*, for a description of which (with figures) see *Hanbury's Science Papers*" (*Dr W Dymock, Bombay*) (*Compare with the account at page 37 of the tarnish-like juice alluded to by Dr. Dymock*)

An intoxicating liquor is by some authors said to be prepared from

MANNA.
187LIQUOR.
188

ferment their *Giya* with its milk sap"

Mr. Lisboa (*Useful Plants of Bombay*), on the other hand, says—

CALOTROPIS
gigantea.
The Swallow-worts.
LIQUOR.

known to the people on the eastern side of the peninsula. This would
 ; reached India from
 a historic point of
 should be remembered, however, that the sacred *Soma* of the ancient Sanskrit writers has by
 many botanists been associated with a species of *Sarcostemma*, a genus
 belonging to the same tribe of Swallow-worts, and not very far removed
 from *Calotropis*. We have abundant evidence of the antiquity of the

above.

TIMBER.
TIMBER.
189

Structure of the Wood.—The plant rarely produces wood of any size;
 it is, however, valued for making charcoal, and is employed as gunpowder
 charcoal in Kathiawar and in the Deccan. (*C. P. Gaz.*, 504.) It is also
 made into gunpowder charcoal in the Godavari District.

DOMESTIC AND SACRED USES.
DOMESTIC.
190

Domestic and Sacred Uses.—**MANURE**—"The leaves and stalks serve
 for reclaiming *reh* (covered with saline efflorescence) lands. These leaves
 are strewn about the ground and covered with earth, and then crushed by
 being stamped upon. Water is then set on the land enough to flood it.
 When the
 undated
 as the nat
 years became so free from saline matter as to yield a very fair crop."
 (*Lisboa, Us Pl, Bomb*, 233) "In Mysore the branches are much sought
 after as a manure for paddy-fields. It is estimated that wet land thus
 manured will yield a much superior crop." (*F. Cameron, Mysore*) The
 leaves and twigs are used in Madras to manure the fields (*Indian*
Fl. for 1890). Col. Ditcher, writing to the author that he has chemi-
 to discover whether or not they
 an effect on *reh* soil. He has

that *dk* leaves have a spec

"The flowers are use
 (*Bomb Gaz*, VII, 42.) I
 flower are carefully pick
 which are worn at certain
 from Mr. Lisboa's *Useful*

"In *Chaturmas Maha*

Rushi, taken from *Skand Purân*, this tree is mentioned to be the trans-
 formation of *Surya*, or the Sun. It is used in various ceremonies, both reli-
 gious and those of time-hallowed custom. The leaves are used as *patra*,
 in the same way as those of *shami*, in the worship of *Ganpatti*, *Haridâlikâ*,
Pithori, &c. They are also employed in *shusti puja* (a ceremony per-
 formed on the sixt
 dness of Destiny) by
 believed that the

mony, the man is first married to this tree, which is then cut down. This
 ceremony is believed to ensure the longevity of the fourth, but really the
 third wife whom he now marries

The Swallow-worts.

CALOTROPIS
procera.

"It is ordered in the *Shravan Mâhâtma* to worship *Mâruts* (who is also known as *Hanuman*), or the Monkey-god, on every Saturday, with a garland of the flowers of this tree, which are then offered to him. The twigs are also ordered to be used as substitutes for tooth brushes in the *Smritisar Granth*. They are also employed as *Samidhas* for the feeding of sacred fires, as mentioned before."

Mir Muhammad Husain gives a good description of this plant, and mentions the fact that the wandering Arabs and Tartars make their *Makhad* twist or *Yalish* tinder from the seed floss.

Calotropis procera, R. Br. ; Fl. Br. Ind. IV, 18; Wight, Ic. t. 1276

191

Syn.—C. HAMILTONII, Wall.

Vern.—*Safed ak, dk, dg, madâr, diadd*, HIND, *Âk shakar ul ushar, shakar al lighal*, PB, *Spulmer, spalmak, pashkand*, TRANS INDUS, *Âk*, SIND, *Mân idra*, MAR, *Alarka SANS*, *Vellerku*, TAM., *Ma jo-pin, mekabin*, BURM., *Spalmakka*, ARG.

Moodeen Sheriff, as well as U. C. Dutt, gives the same vernacular names for both the species of *Calotropis*.

References.—*Brandis, For Fl.*, 331, *Kurs, For Fl.*, Burm., 11, 200; *Gamble, Man Timb.*, 215; *Dals & Gids, Bomb. Fl.*, 140; *Stewart, Pb Pl.*, 144, *Aitchison, Cat Pb Pl.*, 90; *Vogel, Hort. Sub Cal.*, 540; *Pl. Ind. Ind.*, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

Cyclop. Smith, Dict., 278, 431, *Treasury of Botany; New Official Guide to the Museum*, p. 97.

Pl. Ind. Ind., 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

Gum.—As in preceding species.

Medicine.—As under *Calotropis gigantea*. Root of this species specially mentioned as used by the Pathans for tooth-brush, having the merit of

which he says is not so effectual as the juice of the aloe.

Special Opinions.—§ "The fresh milk is employed in the Panjâb for the purposes of infanticide. [The mouth of the uterus is brushed with fresh twigs of the plant in other parts of India.—FD.] In a drachm dose the fresh juice will kill a large dog in 15 minutes, its action, though slower, resembles that of hydrocyanic acid, but commences with foaming at the mouth" (*Brigade Surgeon J. E. T. Aitchison, Simla*). "The juice is first rubbed on the skin, and subsequently ashes are put to darken the patch, and make it look like ecchymosis or bruise" (*Assistant Surgeon Bhugwan Dass, Rawal Pindi, Panjâb*). "The flowers are used in cases of cholera." (*Surgeon-Major D. R. Thomson, Madras*).

Fodder.—Used as a camel fodder (*Sind Gaz.*, 522). According to Dr. Stocks, in his *Plants of Sind (Records of the Govt. Panjab, A. 11., 606)*, one of the four plants which the camel will not eat (*See Camel Fodder*).

Domestic Uses.—In Oudh this species is regarded as an ill-favoured weed, notwithstanding its usefulness.

GUM
Gutta percha.
102
MEDICINE.
Root
103
Milk
104

Flowers.
195
FODDER.
196
DOMESTIC.
Too-br.
br. ca.
197

CAMELUS.

The Camel.

CALTHA, Linn.; Gen. Pl., I., 6.

198

Caltha palustris, Linn.; Fl. Br. Ind., I., 21; RANUNCULACEÆ.

THE MARSH MARIGOLD.

Vern.—*Mamiri*, *baringū*, Pb.References.—*Stewart's Pb. Pl.*, 2; *Smith's Dic.*, 258; *Treasury of Botany*.

Habitat.—Marshes of the western temperate Himālaya, from Kashmir to Nepal; altitude 8,000 to 10,000 feet.

Medicine.—In Hazara the root is considered poisonous.

MEDICINE.

199

Caltrops terrestrial, see *Tribulus terrestris*; aquatic, see *Trapa bispinosa*.*Calumba* Root, see *Jateorhiza palmata*, Miers.; MENISPERMIACEÆ.

CALYCOPTERIS, Lam.; Gen. Pl., I., 686.

200

Calycopteris floribunda, Lamk.; Fl. Br. Ind., II., 449; Roxb., Cor. Pl., t. 87; COMBRETACEÆ.Syn.—*GETONIA FLORIBUNDA*, Roxb., Fl. Ind., Ed. C. B. C., 379.Vern.—*Kohorany*, C. P.; *Ukshi*, MAR.; *Bandi murududu*, TEL.; *Mar-sada bolli*, MYSOR.References.—*Brandis*, For. Fl., 220; *Kurs*, For. Fl., Burm., I., 458; *Gamble*, Man. Timb., 185; *Dals. & Gibs.*, Bomb. Fl., 91.

Habitat.—A large, climbing shrub of Central and Southern India, and from Assam to Singapore. Found from plains up to 2,500 feet above sea.

Medicine.—Young twigs when cut give out watery fluid used medicinally.

MEDICINE.

201

TIMBER.

202

Structure of the Wood.—Yellowish white, moderately hard, tough, with numerous broad medullary patches of soft, pith-like texture. Used for making tool-handles.

Calysaccion longifolium, Wight; Ill., I., 130, & Icon., t. 1999; see *Ochrocarpus longifolius*, Benth. & Hook. f.; GUTTIFERÆ.*Calyptanthus*, see *Eugenia*.

THE CAMEL.

203

Camelus, Linn.

... contains only two species—both Asiatic—
 ... It is by zoologists referred to
 ... the New World by the LLAMA and
 ... animals, all belonging to the genus
 AUCHENIA. The CAMELIDÆ, in many respects, constitute an aberrant group
 of the Ruminantia, and are distinguished from the other members of the
 order by the structure of the teeth and the form of the horns.

TWO
SPECIES.

The Camel.

CAMELUS.

...ian camel
...omestication
...their con-
...to Pisa by
one of the Dukes of Tuscany. ...
been introduced to Australia ...
taken kindly to the sandy expan-
bushes abound, similar to those
warm countries. The Bactrian camel, on the other hand, requires a colder
climate than the dromedary. The Russian Asiatic explorer, Colonel Pre-
jevalsky, would appear to have discovered this animal east-south-east of
Lob-nor, in what some authors deem a truly wild or indigenous condition,
and others a naturalised state—in escape from domestication. Which-
ever view may be taken of this question, the Bactrian camel, in its domes-
tication, is distributed from the point fixed by Prejevalsky as its indi-
genous habitat, throughout the region north and east of that inhabited
by the dromedary, or from the Black Sea to China and northward to

they are prized as beasts of burden by the inhabitants of such countries.
The Bactrian camel is smaller than the dromedary, has longer, darker,
and more plentiful hair, and the pads of its feet are much harder (an
adaptation doubtless to the rocky region it inhabits) than those of the
Arabian camel. Palgrave, however, informs us that dark-coloured or
even black camels exist in Arabia, and that the term dromedary should
be restricted to the pale coloured, more elegantly-formed breed, which
might be designated as the high-blooded race horse of his species. Ac-
cording to some writers the camel is one of the oldest mammals now
living, since fossil remains have been found in the Siwaliks of a species,
which, but for its being a little larger than the Arabian camel, is scarcely
distinguishable from it. How far this fact may be accepted as throwing
light upon the original home of the animal is a matter of speculation.
The Siwalik mountains, which skirt the foot of the Panjáb Himalaya,
have now been satisfactorily established as belonging to the *pliocene* period
of Geologists, although many earlier or *miocene* forms seem to have survived
in the Siwalik *pliocenes*, just as many animal forms of the latter, including
the camel, have continued to the present day. Thus wild camels may be ac-
cepted as having once upon a time existed in what is now Northern India,
or in the region south of the present Himalayas, but at the present day the
animal only occurs there in a state of domestication and need not by any
means be the actual descendant of the Siwalik camel. It is remarkable,
however, that no one has ever seen the one-humped camel in a wild state,
and unless we are to accept the somewhat extreme view that they may
after all be but varieties of one species (hence producing a fertile hybrid
or cross-breed) Prejevalsky's home of the two-humped camel need have
no bearing on the question of the nativity of the so-called Arabian camel.

Colonel Yule, in his most instructive "*Introductory Remarks*" to Pre-
jevalsky's *Mongolia*, gives a valuable summary of the various references by
authors to the wild camel. He says "This is a somewhat interesting
subject, for disbelief in the existence of the Wild Camel has been strongly
expressed, and indeed not long since, by one of the greatest of scholars as
well as geographical authorities on Central Asia. It is worth while,
therefore, to observe that its existence by no means rests on the rumour
heard by Prejevalsky. There is much other evidence, none of it, perhaps,

A FOSSIL
CAMEL.

204

WILD
CAMELS.

205

CAMELUS.

The Wild Camel.

very strong taken alone, but altogether forming a body of testimony which I have long regarded, even without recent additions, as irresistible."

Since Ool Yule published the above opinion, Prejevalsky has himself shot the so-called wild camel near Lob-nor, so that it is now very generally accepted that a wild two-humped small and very woolly camel does exist in the region referred to.

Vernacular Names — *Chamrau*, Fr., *Kamsel*, Cyr.; *Kamelos* Gr.; *Shi* or *ut* Hind., *Tamal* or *Infia*, Malay; *o* the camel.

The Names
given to the
Camel

8 years of age it is *armosh* or *ut* (male), *mu* (female).
up to 8 years of age it receives the following names:—

	To 1 year	To 2 years	To 3 years	To 4 years	To 5 years	To 6 years	To 7 years	To 8 years.
Male	<i>Toda</i>	<i>Masat</i>	{ <i>Trishun</i> , <i>Lahak</i>	<i>Chhatr</i>	<i>Doat</i>	<i>Chhiga</i>	<i>Nesh</i>	<i>Nesh</i>
Female	<i>Todi</i>	<i>Masat</i>	<i>Puraf</i>	<i>Lihari</i>	<i>Trokar</i>		<i>Kuteli</i>	

M Kostenko tells us that in Turkistan the two-humped camel is called *tuya* and the one-humped *nar tuya*.

References — The following authors may be consulted — Wellsted, Chesney, Stewart, Huc (Recollections of a Journey), Ferner, Mignan, Pott nger (Beluchistan), Fontain (Egypt), Rob nson, Postan, Kostenko, Prejevalsky, Palgrave, and the writings of many other travellers.

BREEDS AND RACES OF CAMELS

Breeds

206

This subject has already been alluded to while discussing the subject of the habitat of the camel. Veterinary Surgeon Charles Steel, in a paper read before the Asiatic Society of London in 1878-79 states that of the "breeds" which appear to be extensive,

Rajputana supplies a great many, and from that district were derived those which were used during the siege of Delhi; our camels in South Afghanistan were almost all Sind amongst which was a very small proportion of females, whereas, with the northern army, they are reported to have abounded, we had a small number of *Pahari* or hill camels, and a few

ful, distinguished by their nting in some instances to ind hind extremities being matic changes very great, air, is of lower stature as a development posteriorly, use, and I had no oppor-

tunity of making a *post mortem* examination.

"The Persian possesses a thick coat, splendid capillary appendages, and a deep and graceful curve, he has a tendency to observe that as the hair began to fall off in

The Camel.

CAMELUS.

patches, presenting a mangy appearance; this would probably be restored on the return of cold weather; there were only a few specimens, bought by officers above Kandahar as curiosities, so that there was little opportunity of judging as to their qualifications for transport."

MORTALITY AMONG THE CAMELS USED IN THE AFGHAN WAR.—The verdict passed by the various officers whose opinions were called for on the subject of the losses of camels during the Afghan campaign was most pronounced and uniform. The plains camels were preferable for the transport service on the hotter or Indian side, but were quite useless for the higher and colder regions. Of the plains camels those of Bikanir were superior to the Panjáb, and these again better than the camels from Sind. The majority of the camels that died at Thul during June seem to have succumbed to heat-apoplexy, while in the higher altitudes, death appears to have been caused through some affection of the lungs. The hill camels perished through the heat of the Bolan pass and the plains camels by the cold of the higher regions, but both had previously endured privation and excessive fatigue. It is reported that of one consignment of Panjáb camels nearly 39,000 died or were lost by desertion, but it is probable that if the losses among the Sind, Baluchistan, and other camels, from the commencement to the final termination of the campaign were to be added to that number, the total losses might be close upon 60,000. These facts are alluded to mainly with the object of showing how the various breeds of camels have been acclimatised to widely different conditions. Some are suitable for the caravan traffic over hot sandy regions, which has given to this beast of burden the appellation of the "ship of the desert," while others have been so far altered in their habits and character as to be useful on rocky and mountainous countries and be even capable of sleeping on ground from which the snow has been only removed for their accommodation. The principal breeds of camels have a great aversion to water, the animals clearing rapidly when

BREEDS.

Mortality.
207

aversion to

ing the Central Asiatic and Afghan breeds of camels

PANJAB CAMELS.—The following extracts from the Gazetteers regarding Indian camels may be found useful. According to the *Panjáb Gazetteer* for Jhang there are in that district two breeds of camels. These are known as the *Thalwan* and the *Bars* or *Bari*. The Thal camel is a much lighter animal than the Bar, and cannot carry so heavy a load. The female of either breed comes into heat when it is three years old, from the middle of January to the middle of April, and it may breed from that date for 20 years, and during the same period the male may be worked but the female is rarely laden. A good male camel will carry a load of 8 maunds, and he will take double marches of from 20 to

Panjab.
209

The Camel.

CAMELUS.

patches, presenting a mangy appearance; this would probably be restored on the return of cold weather; there were only a few specimens, bought by officers above Kandahar as curiosities, so that there was little opportunity of judging as to their qualifications for transport."

MORTALITY AMONG THE CAMELS USED IN THE AFGHAN WAR.—The verdict passed by the various officers whose opinions were called for on the subject of the losses of camels during the Afghan campaign was most pronounced and uniform. The plains camels were preferable for the transport service on the hotter or Indian side, but were quite useless for the higher and colder regions. Of the plains camels those of Bikanér were superior to the Panjáb, and these again better than the camels from Sind. The majority of the camels that died at Thul during June seem to have succumbed to heat-apoplexy, while in the higher altitudes, death appears to have been caused through some affection of the lungs. The hill camels perished through the heat of the Bohn pass and the plains camels by the cold of the higher regions, but both had previously endured privation and excessive fatigue. It is reported that of one consignment of Panjáb camels nearly 39,000 died or were lost by desertion, but it is probable that if the losses among the Sind, Baluchistan, and other camels, from the commencement to the final termination of the campaign were to be added to that number, the total losses might be close upon 60,000. These facts are alluded to mainly with the object of showing how the various breeds of camels have been acclimatised to widely different conditions. Some are suitable for the caravan traffic over hot sandy regions, which has given to this beast of burden the appellation of the "ship of the desert," while others have been so far altered in their habits and character as to be useful on rocky and mountainous countries and be even capable of sleeping on ground from which the snow has been only removed for their accommodation. The principal breeds of

BREEDS.

Mortality.
207AVERSION TO
WATER.

greater attention should be paid to the selection of camels than appears hitherto to have been done, and it might be even commended as a desirable step to organise breeding stations on the hills for the rearing of

ing the Central Asiatic and Afghan breeds of camels.

PANJÁB CAMELS.—The following extracts from the Gazetteers regarding Indian camels may be found useful. According to the *Panjáb Gazetteer* for Jhang there are in that district two breeds of camels. These are known as the *Thalwan* and the *Bars* or *Barí*. The Thal camel is a much lighter animal than the Bar, and cannot carry so heavy a load. The female of either breed comes into heat when it is three years old, from the middle of January to the middle of April, and it may breed from that date for 20 years, and during the same period the male may be worked but the female is rarely laden. A good male camel will carry a load of 8 maunds, and he will take double marches of from 20 to

Panjab.
209

CAMELUS.

The Wild Camel.

in the region referred to.

Vernacular Names.—*Chameau*, FR.; *Kameel*, GER.; *Kamelos*, GR.; *Camello*, IT. and SP.; *Camelus*, LATIN; *Unl*, or *ul*, HIND.; *Tamal* or *gamal*, ARAB.; *Ottagam*, TAM.; *Lott-pitta* or *wonte*, TEL.; *Unla*, MALAY.

In most parts of India there are different names given to the camel

The Names
given to the
Camel.

	To 1 year.	To 2 years.	To 3 years.	To 4 years.	To 5 years.	To 6 years.	To 7 years.	To 8 years.
Male	<i>Toda.</i>	<i>Matat.</i>	{ <i>Trihun,</i> <i>Lhak.</i>	<i>Chhatr.</i>	<i>Doak.</i>	<i>Chhiga.</i>	<i>Nesh.</i>	<i>Nesh.</i>
Female	<i>Todi.</i>	<i>Masat.</i>	<i>Puraf.</i>	<i>Lihari.</i>	<i>Trokar.</i>		<i>Kuteli.</i>	

M. Kostenko tells us that in Turkistan the two-humped camel is called *tuya* and the one-humped *nar-tuya*.

References.—The following names have been listed: *Waller's* *Chesney*, *Stewart*, *ottinger*, *(Beluchir)* *valsky*, *Prejs-*

BREEDS AND RACES OF CAMELS.

Breeds.

206

abounded; we had a small number of *Pahari* or hill camels, and a few

there were only a few of the *...* had no oppor-

The Camel.

CAMELUS.

patches, presenting a mangy appearance; this would probably be restored on the return of cold weather; there were only a few specimens, was little

BREEDS.

THE VERDICT.—The verdict passed by the various officers whose opinions were called for on the subject of the losses of camels during the Afghan campaign was most pronounced and uniform. The plains camels were preferable for the transport service on the hotter or Indian side, but were quite useless for the higher and colder regions. Of the plains camels those of Bikanir were superior to the Panjáb, and these again better than the camels from Sind. The majority of the camels that died at Thul during June seem to have succumbed to heat-apoplexy, while in the higher altitudes,

Mortality.
207

privation and excessive fatigue. It is reported that of one consignment of Panjab camels nearly 39,000 died or were lost by desertion, but it is probable that if the losses among the Sind, Baluchistan, and other camels, from the commencement to the final termination of the campaign were to be added to that number, the total losses might be close upon 60,000. These facts are alluded to mainly with the object of showing how the various breeds of camels have been acclimatised to widely different conditions. Some are suitable for the caravan traffic over hot sandy regions, which has given to this beast of burden the appellation of the "ship of the desert," while others have been so far altered in their habits and character as to be useful on rocky and mountainous countries and be even capable of sleeping on ground from which the snow has been only removed for their accommodation. The principal breeds of camels have a great aversion to water, the animals sickening rapidly when brought into a damp atmosphere. To the majority of camels, a slippery path,

AVERSION TO
WATER.

however, a much smaller animal than the camel, and perhaps even greater results might be looked for in the direction of acclimatising and improving the Central Asiatic and Afghan breeds of camels.

PANJAB CAMELS.—The following extracts from the Gazetteers regarding Indian camels may be found useful. According to the *Panjab Gazetteer* for Jhang there are in that district two breeds of camels. These are known as the *Thalwan* and the *Bars* or *Bari*. The Thal camel is a much lighter animal than the Bar, and cannot carry so heavy a load. The female of either breed comes into heat when it is three years old, from the middle of January to the middle of April, and it may breed from that date for 20 years, and during the same period the male may be worked but the female is rarely laden. A good male camel will carry a load of 8 maunds, and he will take double marches of from 20 to

Panjab.
209

CAMELUS.

The Camel.

BREEDS.

30 miles a day comfortably. In Montgomery it is stated there are three breeds known as *Solih*, *Gadli*, and *Hariri*—terms which seem to apply to the colour of the animal. "The *Solih* camel has long legs, a long sized head, thick skin, and is of a brown colour. The *Gadli* camel is grey, and has a large head, small mouth, and thin skin. The *Hariri* camel has a small tail and is of a red colour. This is the worst of the three kinds, as it has no endurance on a journey. The *Gadli* is the best." "The camels of this district are of no use for milking." "Large herds go down annually to Bhawalpur for employment." "It well treated a camel will live for 40 years." The coupling season is from December to March, and at 4 years of age the female brings forth her first young one, gestation having lasted for 12 months. She continues bearing 9 or 10 times, at intervals of 2 years. After a year the young one is weaned, but it begins to pick grass when it is only 22 days old. A camel will feed her young and yield 12 seers of milk a day besides. The owner milks the cow twice a day, leaving two teats for the young one. The milk yields curds and butter-milk, but not butter. It acts at first as a laxative

Gestation.

camels are superior to those reared in the Derah Ismail Khan district, being similar to those in the Panjāb generally. "No good riding camels are bred in the district, the few that there are being imported from Bhawalpur and Bikaner." By the age of 16 a she-camel will have had six foals, which is about the maximum number for Thal. The Chenab camels are said to bear from 8 to 10 foals, owing to the superior quality of the milk, though I believe that

Sind.

210

SIND CAMELS—The *Sind Gazetteer*, speaking of the Jerruck district, says: of the domestic animals the one-humped camel takes the first place as a beast of burden. "Close to the sea-coast they are scarce, but in the upper part of the delta droves of forty to fifty are frequently seen. The delta-bred camel is smaller and lighter in limb than his Arabian congener, and he is a more docile animal. The Karachi division—one of the best bred in the Thar and Parkar district."

Rajputana.

211

... famous all over India. The *Gazetteer* says: "it is generally either finer or more serviceable than those of any other part of India. The horses, if not fine, are strong and wiry; and I have known a very ordinary-looking mare carry its rider eighty miles through sand one day and

Bombay.

212

... learned regarding the Bombay camels. In the Gujarat (*Gazetteer, Ahmedabad District*) it is stated that the Ahmedabad camels are less prized than those brought from Mārwar

The Camel.

CAMELUS.

in which it is employed. For a short distance, and in
 lithy ca
 e h i s t
 load (.

miles a day (of 8 to 10 hours) have to be performed. If movements are desired the burden should be proportioned. In Algeria, Morocco, Tunis, Tripoli, 300 to 400 lb. to 550 lb. In Syria, Asia Minor, Turkey in Asia, to 600 lb., but large-sized bull-camels are usually used in Afghanistan, Kabul, Hindustan, Tibet, Burma, and Mongolia. In the latter case the Bactrian or two-humped camel is

well says the Panjāb camels known as *Sangar* are in their prime. They are in their prime from 4 to 12 years. Purchased beyond that age, although a good camel

Prime age
 4-12 years.
 219

It is also a common practice to anoint the body with oil at intervals. Kostenko says that the Turkistan camel can trot at the rate of $2\frac{1}{2}$ miles an hour with a full load, but if lightly loaded it can trot at $3\frac{1}{2}$ miles. The trotting camel gets over $6\frac{1}{2}$ miles an hour. If correct it may be added that a good Bikanir camel is faster than the Turkistan animal. The trotting camel is very easy, but the gallop extremely disagreeable. Swift camels can get over 100 miles a day at a push, but the ordinary camel will keep up day after day is about 40 to 50 miles. An instance of an Arab having accomplished 100 miles in 28 hours, thus keeping up 8 miles an hour. General Chesney mentions that he crossed from Basrah to Aleppo in 19 days, a daily rate of 50 miles. In this connection that in 1791 Mr. James Rennell made observations of the Royal Society, that, owing to the unsuitability of the camel, that animal might be employed during geographical exploration. He cited that between Aleppo and Bussora had been accomplished in 322 hours, by Cupper in 310 hours, by Hunter in 299 hours being accounted for by the slightly different

Rate of
 marching 21
 to 4 miles
 220

the camel to their carts, the shafts being attached to the foremost hump. When so yoked to a properly-constructed cart they are sometimes seen

Camels in
 harness
 221

has compelled the present article to give even the common names or their modes of treatment liable to a number of diseases attacks of infectious diseases purposes by far the most

DISEASES.
 222

CAMELUS.

The Camel.

grass. The period of the year when rutting commences seems to have been so modified under domestication that the young are born in summer or at least during pleasantly hot weather. Kostenko tells us that in Turkistan the male gets *must* in the winter (from December to January), but in India this occurs from January to April. During this period the male refuses food and water and becomes unmanageable. The female is rarely worked, but is reserved for breeding purposes, and to supply the milk on which the camel breeders largely live. If well cared for a camel will live for 40 to 45 years.

POWER OF ENDURANCE

Privation from both food and drink—Incidentally allusion has been made, in speaking of the anatomical peculiarities of the camel, to its power of endurance. It is perhaps only necessary to state here that the most conflicting experiences of travellers and observers prevail as to the power of endurance of the camel. It may be premised that an exaggerated acceptance of this notion must of necessity prove dangerous. If anything was demonstrated more clearly than another by the high mortality among the camels during the late Afghan campaign it was, that once the camel's

Privation
215

Eating
poisonous
plants.

camels from the plains of India at all events were observed to eat plants which the hill camels would not touch, and which have the local reputation of being poisonous to the camel. In another paragraph will be found a list of the camel fodders and of the few plants which the camel

Privation
from Water.
216

without water will kill the camel unless the fodder given is green and moist. Kostenko tells us that camels eat only during the day; they eat quickly and are satisfied with 2-3 hours grazing. If subjected to pri-

Death from
Repletion.
217

The Hump

tion, it can also eat to excess during times of plenty. Pottinger, in preparing for an expedition, gave his camels 15lb of flour a day in addition to all the grass they could eat. So greedy is the camel of food, after a few days' desert marching, that Sir Samuel Baker says, when it arrives in good pasture, it often dies in a few hours from inflammation caused by repletion. Reference has already been made to the popular notion

LOAD, &c.

LOAD, DISTANCE, AND RATE OF MARCHING.

The camel is not a creature of great strength, and its power of endurance is

The Camel.

CAMELUS.

nature of the work or which it is employed. For a short distance, and in its usual avocation, a healthy camel will carry about 1,100 to 1,200lb, but

Average load,
400lbs
218

300 to 500lb; but in the latter case the Bactrian or two-humped camel is employed

Colonel J. I. Boswell says the Panjáb camels known as *Sangar* are

Prime age
4-12 years.
219

dose of alum. It is also a common practice to anoint the body with oil at this period so as to prevent mange. Kostenko says that the Turkistan camel walks at the rate of $2\frac{1}{2}$ miles an hour with a full load, but if lightened he will go 3 to $3\frac{1}{2}$ miles. The trotting camel gets over $6\frac{1}{2}$ miles an hour. If these figures be correct it may be added that a good Bikanír camel trots much faster than the Turkistan animal. The trotting motion is said to be very easy, but the gallop extremely disagreeable. Swift camels are reported to get over 100 miles a day at a push, but the ordinary journey which they will keep up day after day is about 40 to 50 miles. Fortune mentions an instance of an Arab having accomplished a journey of 225 miles in 28 hours, thus keeping up 8 miles an hour continuously. General Chesney mentions that he crossed from Basrah

Rate of
marching $2\frac{1}{2}$
to 4 miles
220

a daily rate of 50 miles
Mr. James Rennell
that, owing to the un-
usual might be employed

to measure distances during geographical exploration. He cited that the distance between Aleppo and Bussora had been accomplished by Carmichael in 322 hours, by Copper in 310 hours, by Hunter in 299½ hours, the variations being accounted for by the slightly different tracts followed.

The Kirghiz often harness the camel to their carts, the shafts being fastened by a cord passing behind the foremost hump. When so yoked they will draw 730lb, but if harnessed to a properly-constructed cart they will draw 1,800 to 2,160lb. In Rajputana the camel is sometimes seen yoked to the plough.

Camels in
harness.
221

DISEASES.

DISEASES,
222

est facts regarding the diseases of the camel or their modes of treatment. It is generally believed that the camel is liable to a number of diseases peculiar to itself, but is not subject to the attacks of infectious diseases which carry off other cattle. For military purposes by far the most

CAMEL FODDERS.

Plants eaten by Camels

serious disorder is the result of careless loading and a badly fitting saddle. With care these need not occur, and after the next best preventive is to ascertain if nothing is more annoying to the camel or a more fruitful source of sores than a load heavier on one side than the other. It has already been stated that many of the camels employed in the Afghan campaign succumbed to heat and others to cold, but it has been contended that the privation they endured for some time previously was the actual cause of death. This seems to be proved by the immunity enjoyed by the camels belonging to the officers, most of which returned in safety to India after passing through both the heat and the cold to which they were exposed while accomplishing for months heavy and forced marches. For an account of the diseases of the camel and their treatment, the reader is referred to a valuable memorandum written by Dr W Gilchrist, of the Madras Army, in 1842, and which to this day is perhaps the best treatise that has appeared.

Kostenko says the disease known in Turkistan as *Sarpo* causes the soles of the animal's feet to fall off, and he adds, that as with all the other diseases to which the camel is subject, this is treated by the nomads by freedom from work and good food.

FOOD AND FODDER.

To keep a camel in health it should be allowed 6 hours' grazing and

in the foregoing account, and winter, when the country is villow. Of the plants which are important than the others, because no other animal can subsist on them, and they are accordingly treated as more peculiarly camel fodders. It would be much easier, however, to enumerate the plants which the camel will not eat, or which are poisonous to it, than to mention those on which it may be fed. The latter would almost mean a list of the plants of India. The practical object will therefore be met by furnishing two lists, viz, the plants mentioned by authors as more peculiarly camel fodders and the plants of which the camel will either not eat or on which at least it cannot subsist or which are poisonous to it.

CAMEL FODDERS.

1. *Acacia arabica*, Willd., LEGUMINOSÆ.
2. *A. Farnesiana*, Willd.
3. *Ægiceras majus*, Gertn., MYRSINÆ.
4. *Albizzia Lebbeck*, Benth., LEGUMINOSÆ.
5. *Alhagi maritima*, Desv., LEGUMINOSÆ.

THE CAMEL THORN OR SHUTAR KHAR

Ve - ~

تامير
Dura
ARAB

Plants eaten by Camels

CAMELUS.

A widely distributed shrub of the Ganges valley and the arid and FODDER
Camel Thorn.

camel, and so much does that animal depend upon this plant that it has received the name of the camel-thorn. An officer, writing after the close of the Afgha

Pishin. I

collect it

probable t

stored for winter use

6. *Amarantus polygamus* Linn. AMARANTACEÆ

7. *Anthrocnemum indicum*, Moq. CHENOPODIACEÆ

8. *Atriplex Stocksii*, Boiss. CHENOPODIACEÆ

9. *Avicennia officinalis*, Linn. VERBENACEÆ

10. *Bauhinia racemosa*, Lam. LEGUMINOSÆ.

11. *Berberis*, various species, BERBERIDACEÆ

12. *Calligonum polygonoides*, Linn. POLYGONACEÆ.

13. *Carduus nutans*, Linn. COMPOSITÆ

14. *Corchorus Antichorus*, Rausch. TILIACEÆ

15. *Cressa cretica*, Linn. CONVULVULACEÆ.

16. *Crotalaria Butia*, Ham. LEGUMINOSÆ

17. *Dalbergia Sissoo*, Roxb. LEGUMINOSÆ

18. *Dodonæa viscosa*, Linn. SAPINDACEÆ

19. *Eclipta alba*, Hassk. COMPOSITÆ

20. *Haloxylon multiflorum*, Bunge. CHENOPODIACEÆ

Syn.—*ANABASIS MULTIFLORA* Moq

Vern.—*Gora lani*, *lana* or *lané*, SIND, *Ghalme*, TRANS INDUS

Common in the North-Western Panjab and the Salt Range, and distributed to Afghanistan. Camels are fond of the plant

The Lani

21. *H. recurvum*, Bunge.

By mistake this plant was alluded to by Stewart, and following him by all subsequent authors, including the writer (see B 162) as *Caroxylon Grifithii*, Moq. an Afghan plant not found in India. *Haloxylon recurvum* is the plant from which *khar sajj* is chiefly made in India, and it is the salt plant most relished by the camel

Khar-Sajji

It is known in the Trans-Indus as *laghm*, and in Cis-Indus as *khâr*, in Sind as *kari lani*. A writer in the *Panjab Gazetteer* says that camels thrive best if fed one day upon the *lani* and the next upon the *pslu* (*Salvadora oleoides*). The term *lani* appears to be almost generic for all the Chenopodiaceous plants alluded to in this list, but it is more especially applicable to this species.

CAMEL FODDERS.

Plants eaten by Camels.

FODDER

- 22 *Halocharis violaceæ*, Bunge, CHENOPODIACEÆ
 23 *Iodigofera pauciflora*, Delile, LEGUMINOSÆ.
 24 *Kochia indica*, Wight, CHENOPODIACEÆ
 25 *Lippia nodiflora*, Rich, VERBENACEÆ
 26 *Leptadenia Spartium*, Wight, ASCLEPIADACEÆ
 27. *Lycium europæum*, Linn, SOLANACEÆ.
 28 *Melia Azadirachta*, Linn, MELIACEÆ
 29 *Mimosa rubicaulis*, Linn, LEGUMINOSÆ.
 30 *Mollugo hurta*, Thunb, FICOIDEÆ.
 31. *Phoenix dactylifera*, Linn, PALMÆ
 32 *Pistacia integerrima*, f L. Stewart, ANACARDIACEÆ
 33 *P. mutica*, Fisch. & Thes.
 34 *Prosopis spicigera*, Linn, LEGUMINOSÆ
 35 *Psoralea plicata*, Delile, LEGUMINOSÆ
 36 *Quercus ilex*, Linn, CUPULIFERÆ

THE HOLLY OAK

The Oak.

Vern — Charrei, seret, balut, sháh balút, ARG, Chur, bân, kathán ban, irri, yirá khareo, PB, Spercheret, pargá, kharanja, TRANS INDUS

Dr Aitchison says that in Kuram the variety of this plant, devoid of

occur in Pishin

- 37 *Rubia tinctorum*, Linn, RUBIACEÆ
 38 *Salicorola brachiata*, Roxb, CHENOPODIACEÆ
 39 *Salsola foetida*, Del, CHENOPODIACEÆ

Moti lani

Vern — Moti lani, PB; Mitho lani, samunaar lani, SIND

A camel fodder, but also used in the preparation of *khar sajj*, especially near Jhelum

- 40 *S. Kali*, Linn.
 41. *Salvadora oleoides*, Dene, SALVADORACEÆ.

Vern — Kabbar jhar, diar, jal, vani jhdí, ughai, koku, pilu, pil, plewane, mithi tan, HIND, PB, TAM, Pili, MAR, Sadni djar, mithi diar, SIND

Pilu.

A large, evergreen shrub of the Panjáb and Sind, often forming the greater part of the vegetation of the desert, and ascending the Trans Indus hills and Salt Range to 3000 and 4000 feet in altitude. Flowers in April, and its fruit ripens at the beginning of the hot weather. The fruit is sweetish and is largely eaten by the natives.

The leaves serve as fodder for camels

Plants eaten by Camels

CAMEL FODDERS.

42 *Salvadora persica*, Linn

FOODER.

Vern — *ḡit kauri vān*, *kauri jal*, *chhoti vān*, PB; *ḡāl*, N-W P., *Kabar* (under by Stocks) *khari dhar*, *khari djar*, SIND; *Pidda warago-wenki*, TEL.; *Opa*, *ughai*, TAN

A small thick stemmed, soft-wooded tree, wild in many of the drier parts of India, e.g., Panjāb, Sind, Rājputāna, North-West Provinces, Guzerat, Konkan, and the Circars. Produces flowers and very small black red juicy currant-like berries, having a strong aromatic smell, and

asionally eaten as

43. *Suaeda fruticosa*, Forsk., CHENOPODIACEÆ

Vern — *Chhoti lāni*, *lunak phesak lāni*, *baggi lāna*, *dāna*, CIS INDUS, ZAMU, TRANS-INDUS; *Aout lāni* *usak lāni*, *lunak* SIND

A sub-erect bush, common in North-West India from Delhi to the Indus, and distributed westward to Africa and America

Chhoti Lanl.

Employed in the preparation of *khari sijji* but also extolled as a camel fodder. Major Clifford says, it is abundant at Chuckluk in Pishin

44 *S. maritima*, Lamort, and *S. nudiflora*, Moq45. *Tamarix gallica*, Linn. TAMARISCINÆ

Trianthema.—Four species belonging to this genus frequent the sandy tracts of the Panjāb and Sind, and according to Stocks, one or all are known as *Fysur lāni*, they are regularly eaten by camels

The following are the better known species of this genus —

46. *Trianthema crystallina*, Vahl, FICOIDEÆ47 *T. monogyna*, Linn48. *T. pentandra*, Linn.49 *Vitis carnososa*, Lam., AMPELIDÆ50 *Zizyphus nummularia*, W & A., RHAMNÆ

Vern — *Malla bér*, *birar jhari* N W P. *Gangr jangra* SIND *Malla kokni bér* *marabér*, *jand jharbér* *sari biroti* PB., *Karkana*, TRANS INDUS, *Karkanna* AFO

A densely branched small bush met with in the drier parts of India. Mr F. Kinsman, of the Telegraph Department, informs the writer that this plant may be regarded as the most important camel fodder in a great part of Rājputāna. The natives, to cut the plant, have invented a peculiar axe with the cutting edge turned so that it is parallel to the

Rājputana Fodder.

order thus to afford both camel fodder and fuel

51 *Zygophyllum simplex*, Linn. ZYGOPHYLLÆ

PLANTS POISONOUS OR AT LEAST NOT WHOLESOME TO CAMELS

225

1. *Acorus Calamus*, Linn., AROIDEÆ

Vern — *Bach* HIND., *Vekhandā*, BOMB., *Vaj*, ARAB., *Agri turki*, PERS., *Bari boj*, PB

CAMEL FODDERS.

Plants poisonous or not wholesome to Camels.

POISONOUS.

Bach Akri.

A semi-aquatic plant, met with in damp places in India, at altitudes from 3,000 to 6,000 feet

It is reported that at Quetta and Pishin an Iris-like plant, eaten, during the Afghan campaign, by the camels from the plains, proved poisonous to them. The hill camels did not eat the plant. This seems to be the same plant which Mr. Steel speaks of under the name *akri*, a word which may be taken as derived from the Persian name for this plant. Mr. Steel

not quite so
ere poisoned
y be Acorus
Panjab ap-
s no resem-
blance to an Iris whatsoever.

2. *Calotropis gigantea* and *C. procera*, R. Br.; ASCLEPIADACEÆ.

Vern.—*Ak, madder*, HIND, PE. and SIND; *Spalmei, spalma*, Afg; *Ushar*, ARAB.; *Khark*, PERS.

Stocks enumerates this among his four plants which the camel will not eat, but the *Sind Gazetteer* (page 522), under the account of the district Mehar, states that it is a camel fodder. It is probable Dr. Stocks is correct.

3. *Cannabis sativa*, Linn.; URTICACEÆ.4. *Euphorbia nerifolia*, Linn.; EUPHORBACEÆ.5. *E. Royleana*, Boiss.6. *E. Tirucalli*, Linn.7. *Nerium odoratum*, Solander; APOCYNACEÆ.

SWEET-SCENTED OLEANDER.

Vern.—*Kaner, kanira, gankira*, HIND, PE; *Karabi, BENO, Kanhera, kanir*, BOMB.; *Difti*, ARAB.; *Ahar-zahrah* (the Asses-bane), PERS.

A common bush, with large pink or white flowers. Dr. Stocks says of this plant: "It is worthy of remark that the camel eats the *Nerium odoratum* every case

Several
igh death-

rate of ca
however,
poisonous
wholesom
against th
was susp
(Compare with Acorus).

8. *Othonnopsis intermedia*, Boiss.; COMPOSITÆ.

Vern.—*Gansh, Plshru*.

Mr J H Lace, of the Forest Department, Quetta, reports that the Biluchis regard this plant as poisonous to the camel.

9. *Peganum Harmala*, Linn.; RUTACEÆ.

Vern.—*Harmal*, ARAB.; *Isband*, PERS.; *Spelane, karmal*, PE; *Isband*, HIND

A small bush, much branched and densely clothed with dissected leaves. The whole plant strongly scented.

The camel will not eat this plant.

Economic Products derived from the Camels.

CAMEL-HIDE.

10. *Withania coagulans*, Dunal. SOLANACEÆ.Vern — *Airi*, *panir*, Pa; *Panir*, SIND; *Panir bad*, PERS

While this species is not eaten by camels, the allied species, *W. somnifera*, is said to be browsed by goats, and it is possible it may therefore be also eaten by camels. Both species occur in Sind, the Panjab, and are distributed to Afghanistan. (Compare Nos 1 and 7)

CAMEL FLESH AND PRICES PAID FOR THE ANIMAL

PRICES
226

It is stated by writers on the subject that camel flesh is very tough, but that the flesh of the sucking camel is passable. The camel owners are reported to kill and eat the animals that show signs of dying, and that only the rich during festive occasions can afford to kill a young camel. In India the price of a full grown camel seems to average from Rs 25 to Rs 150. At Taskand a camel sells for about £6 to £10, and this price prevails over the greater part of Turkistan. Palgrave, speaking of the Nejdian camels, says the "camel is somewhat slimmer and smaller than the northern, and the hair is finer. They are cheaper in proportion than sheep, twenty-five to thirty shillings is an average price."

CAMEL-HAIR.

HAIR
227

The amount of hair or wool which the camel possesses seems to be inversely to the warmth of the country in which it is found. The two-humped camel has a longer and more abundant crop than the single-humped, and the wild camel most of all. It has already been stated that the natives near Lob nor are said to hunt the wild camel on account of its hair, which is much valued for its softness. The single-humped camel, acclimatised to colder regions, loses its hair when brought into a warm country, but periodically all camels cast their hair, and the natives either wait for this or clip the hair shortly before the period at which it should be shed. This generally occurs in spring in Upper Asia, but not till May or June in India. The cold country camels yield as much as 12lb of hair a year, but in India 2lb is about the average. This is woven into the *boras* or sacks used by the camel-owners, but for this purpose it is usual to mix the camel hair with goat-hair. It is also made into ropes. Bellew says it "is very highly prized."

kind of camel' (*Kashmir and Calcutta International* and at the Agra Jail exhibited carpets made of camel hair. "The camel hair is of a reddish-brown colour, it is made into yarn, and useful. The long hair is employed in Europe for making artists' hair-brushes or pencils, the sable, the miniver, the martin, the badger, and the polecat are also employed

CAMEL HIDE.

HIDE
228

There seems to be little or no export trade from India in camel hide. Locally it is employed for many minor purposes, such as the fastenings used by the camel drivers. With the hair on, it is also manufactured both in Europe and in India into trunks. The chief use to which it is put in India, however, is the manufacture of *kuppas*, or the huge skin jars employed in India for carrying oil or *ghis*. These are most probably made in the Lower Provinces (where the camel does not occur), of cow, buffalo, or

CAMEL'S MILK

Economic Products derived from the Camel.

Kuppa.
229

horse hide, but the writer can discover no account of the manufacture of the immense number of skin or leather jars which form an almost characteristic feature of every bazar in Lower India. It would however, appear that other skins are sometimes employed in addition to camel-hide, but as they are more expensive and more difficult to work, camel-hide is mainly used. The smaller ornamental jars employed for the household supply are, however, chiefly made of the intestinal integuments of the cow, or horse. For this purpose the intestines are boiled in a mouse skin or gluey mass. In both cases

the shape and size. After this it is sun-dried to a desired extent. The fresh camel intestine, freed from the hair, or the prepared intestinal membrane, is then drawn over the mould and beaten until it firmly adheres. The mouth is now formed by working the skin around a stick or bamboo and reflecting the lip in its characteristic shape. When quite dry the clay is broken up and carefully removed. The smaller jars or *kuppi* are also ornamented with patterns cut out in white parchment; after these have been stuck on, the vessels are varnished over the outside. Mr Baden Powell, in his *Punjab Manufactures*, says that at Rohtak the *kuppi* are often made in "fantastic shapes, some like jugs, others flattened and perforated apparently with large holes, which of course can open only longitudinally in the thin flat body of the vase." They are also largely made at Mathura in the Shajhanpore district and at Bikanir in Rajputana, and at Cutch and Ahmedabad in Bombay. An interesting account of the *kuppa* manufacture of Lucknow will be found in Hoey's *Trade and Manufactures of North India* p. 138. It would appear that the *kuppas* of that city use any hide available and construct the rim over a layer of mud permanently enclosed to give rigidity.

Kuppi is made in various sizes, the price varying accordingly. The larger size is often "so" in the story of Ali Baba and the robbers, and may be made to hold one maund or six or eight. It is more than sufficient to contain two ounces may also be procured.

Kuppas should not be mistaken for leather water bottles such as those made at Bikanir and used all over Northern India. Camel-skins sell for about Rs 2 to Rs 3 a piece.

CAMEL'S MILK

It is scarcely necessary to enlarge on this subject further than has already been done. It is regularly used by the camel rears, indeed it forms an important item of their food. To those not accustomed to it it is purgative, and is accordingly recommended as a medicine. It is supposed to give strength to horses, hence is commonly given to foals. According to some writers camel's milk will yield butter-milk but not butter, and by others it is said to afford butter also. The writer has at present no means of settling this point, but a matter of this nature might easily be settled by experiment and thus remove at least one of the numerous anomalies of the camel.

from the flat earthen plates, and is brought to come from European provision store keepers in a saleable trade. It seems to be done in the article although it does not appear anywhere made in India. It is known in the bazars as *muscak ka halwa*.

MILK.
231Halwa
232

The Tea-plant.

CAMELLIA.

CAMELLIA, Linn.; Gen. Pl., I., 187.

TEA.
233

radicle short, superior

The genus *Camellia* is named in honour of Camellus (Joseph Kamel), a Moravian Jesuit and Asiatic explorer. The cultivated or ornamental *Camellias* are mainly derived from *C. japonica*, a native of China and Japan; this was introduced into Europe in 1740. The *Camellias* are easy of cultivation in warm temperate climates, the best soil being a mixture of sandy-loam and peat. The pots should be well drained and the plants sparingly watered, except during the growing season. They are readily increased by cuttings or by inarching on the commoner kinds.

The Chinese tea-planters are said to propagate *C. Sasanqua* as a shelter for their tea plants. This small-leaved species has sweetly-scented red flowers, the odour of which is supposed to be communicated to the neighbouring tea leaves. Sometimes, however, the planters pluck the leaves and even the petals of this species, and mix these with the tea in order to produce a favourite-scented mixture. The black-scented teas, shipped from Canton, are said to be flavoured with the flowers of *Jasminum Sambac*. This is largely grown in the suburbs of Canton, and is there known as *Mok-lei*.

The seeds of *C. drupifera* (formerly known as *C. oleifera*, Wall) yield the largest amount of oil, but all the *Camellia* seeds contain a useful sweet oil. By far the most important of the *Camellias*, however, is that from which Tea is obtained.

Linnaeus, in the middle of the eighteenth century, gave the Tea plant the name of *Thea sinensis* (*T. chinensis*), but soon after, in the second

specific name being derived from the "Wü-f or Bü-f Mountains in the north-west of Fuh-hien, one of the districts most famous for its black tea" (*Nile*). These hypothetical Linnaean species were soon reduced to one, and that referred to the genus *Camellia*, under the name *Camellia theifera*, Griff (*C. Thea*, Link). The so-called wild tea of Assam was next described as a separate species under the name of *Thea assamica*, Masters; but recent investigation has proved this to be but a large-leaved subtropical form of *C. theifera*, and it is open to doubt if it be even indigenous.

The Tea-plant.

CAMELLIA

The cross fertilization of these two forms gave origin to the popular race known as the "Assam hybrid," a term which scientifically must be viewed as incorrect, since it is not a cross between two species but between two forms of the same species. It is more accurately a cultivated form or race holding the same relation to the original species as do the races of wheat or of rice to the plants from which the multitudes of widely different kinds of these cereals have been derived. This is more than a mere technical distinction, since it accounts for many of the peculiarities of this widely cultivated "hybrid" stock (such as the ease by

TEA.
Assam
Hybrid.
235

any improvement in quality or healthiness of stock would result from the production of such a hybrid remains to be seen. Indeed, this may

verted from the cultivation of the plant to the improvement and cheapening of the manufacture of tea, so that the past 50 years of Indian tea cultivation have seen no new forms produced, and perhaps little improvement in the methods of cultivation.

It is constantly protested by the planter that he can distinguish the

course in its strictly scientific sense, and not in the loose popular manner in which it is but too frequently employed. A cultivated recognisable state of a plant is not necessarily a variety. A variety is a fixed natural departure from the specific type, in other words, it is what might be called a lower degree of species. According to this acceptation, all the forms of the mango, for example, must be thrown together as unworthy of the systematic position of constituting even one, still less many, varieties of the wild plant.

236

Assam
Indigenous.
237

would doubtless retain its distinctive features longest, because it has been cultivated for a much greater period and acclimatised to a colder country than Manipur. Some of the forms of Chinese tea are accustomed to a climate with a short but severe snowy winter. There are in India, however, at least four perfectly distinct species of *Camellia*, which might be left for a comparatively indefinite period, growing side by side, without losing one particle of their distinctive features. One of these, with the true tea plant,

(conf. with
235).

CAMELLIA.

The Tea-plant.

TEA.

belongs to the section *Thea* of the genus *Camellia*, viz., *C. candata*, a species met in Bhutan, the Mishmi hills, the Khasia hills, and even in Sylhet and Burma. Has any effort ever been made either to propagate this species, or to use it as a hardy stock for grafting, inarching, or hybridising with, or have its properties, as a possible source of tea, been tested? From a purely theoretical point of view it would seem desirable that this subject receive attention, for, should the suggested hopes of

First Assam
Tea Garden.

instructive paper read before the *Society of Arts* (May 27th, 1887) remarks that—"It is a matter for profound regret that this garden (Chabwa) did not share the fate of its predecessor, for it proved the chief means of disseminating the pest of Assam—the miserable China variety—all over the province, not only by means of seed, but, owing to its prolific inflorescence,* the indigenous Assam plants in the vicinity were impregnated with its pollen, and thus produced the hybrid variety which now forms the great bulk of the plants found not only in India but also in Ceylon." Dr. White does not therefore show much favour either for the introduced China tea plant or for the so-called hybrid between it and the plant found in Assam. Other planters state that a first

increased quantity,
2d. per lb more in
China plant." It
ment, that the Assam tea will fetch more in Mincing-lane, pound for pound,
than Indian-grown China. But is the lesser yield, as Dr. White seems to
think, due to inherent inferior quality or to insuitability to the Assam
climate? Is the China plant, in other words, suited to Assam, and if not, is
it possible by other means than hybridization to improve the Assam
stock? I can only say that I have seen many of the plants which are
ably say
will not fl

* This doubtless means prolific flowering: the flowers are axillary, solitary.

The Tea-plant.

CAMELLIA
drupifera.

TEA.

Camellia caudata, Wall, *Pl. As. Rar.*, III, 36; *Fl. Br. Ind.*, I., 293; *TERNSTROMIACEÆ*.

References.—Griff, *Notul.* IV, 559, t. 601; *Trans. Agri-Hort. Soc. Ind.*, V, 1838, t. A.; Kura, *Fl. Burm.*, I., 109; *Gamble's Man. Timb.*, 30.

Habitat.—A smallish bush, found in the Bhután, Mishmi, Khásia and Sylhet hills, and in Martaban; at altitudes from 3,000 to 5,000 feet above the sea.

Botanic Diagnosis.—Leaves with tapering points, hairy beneath and only 3 to 4 by $\frac{1}{2}$ to 1 inch in size. Flowers white solitary, nodding, with the stamens and styles hairy, as also the outer surfaces of the sepals and petals; sepals persistent.

This species is apparently not used for any industrial purpose, but it has been recommended in the preceding remarks as worthy of careful investigation as a possible source of improvement to the cultivated tea.

C. drupifera, Lour; *Fl. Br. Ind.*, I., 293.

Syn.—C. KISSI, Wall, *As. Res.*, XIII, 429; *Jour. As. Soc., Beng.*, IV, 48, t. 2; *Pl. As. Rar.*, III, 36, t. 256; C. KZINA, Don, *Prod. Nepal*, 224; C. MASTARSA, Griff, *Notul.* IV, 539; C. SIMPLICIFOLIA, Griff, *Notul.* IV, 560, t. 604; C. CAUDATA, Griff (non Wall); C. OLIFERA, Wall.

Vern.—Kissi, lingua, NEP, Chashing, BHUTIA and LEPCHA.

References.—Kura, *For. Fl., Burm.*, I., 109; *Gamble, Man. Timb.*, 30, also *Darjeeling List*, 9.

Habitat.—A large evergreen shrub, with slender, much divided branches, met with in Nepal and on the Eastern Himalaya generally in Bhután, the Khásia hills, Northern Cachar hills, Manipur, Ienasserim, and the Andaman Islands, at altitudes from 3,000 to 8,000 feet above the sea.

Botanic Diagnosis.—Leaves 3 to 4 by 1 to $1\frac{1}{2}$ inches in size, tapering below and having also a long acuminate apex, margin serrulate, especially towards the apex, and often revolute. Twigs puberulent, with loose membranous scales embracing them; the odour of the cherry-laurel. Sepal, not persistent. Petals emarginate, free, woolly at the base.

This is closely allied to the sweetly-scented *C. Sasanqua* of China and Japan, to which allusion has been made as cultivated in China near the bushes in order to afford shade and to impart to the leaf the sweet scent of its flowers.

Oil.—It is believed this species has never been cultivated in India; but apart from any possible service it might be found to render in the direction of the suggested improvement of tea through the production of a better hybrid, this plant would seem worthy of attention as an oil-seed-bearing species. At the Colonial and Indian Exhibition two or three samples of the oil from tea seed were shown and were much admired. Without any appreciable extra trouble this species might be reared as a hedge and yield a fairly remunerative oil crop at the same time. It is a

Species of
Camellia.
238

239

OIL.
240

C. 240

CAMELLIA
theifera.

The Tea-plant.

TEA.

Sasanqua Oil
241

non-drying oil of a superior quality, it is used medicinally in Cochin China, and with the oil from *C. Sasanqua* is no doubt largely sold as tea-seed oil. The latter article is of considerable importance to the tea districts of China and is exported to Europe. It resembles olive oil, burns with a clear bright light, and is free from unpleasant odour.

The oil of *Sasanqua* (Sanskrit = Japanese name) has an agreeable odour, and is used for many domestic purposes. It is obtained first by cold pressure, the pulp being boiled and again pressed.

The leaves are largely used by Japanese ladies for washing the hair. How far the art of perfuming teas in China is carried seems uncertain, but it is possible some of the special brands may owe more to the flowers of *C. Sasanqua* than is at present understood.

TIMBER.
242

Structure of the Wood.—Hard, close, and even-grained; weight 60 lb per cubic foot.

243

Camellia lutescens, Dyer; *Fl. Br. Ind.*, I., 293.

Habstat.—Mishmi Hills

Botanic Diagnosis.—A shrub with much divided pale grey branches. Leaves caudate-acuminate, 2 to 3½ by 1 to 1½ inches, closely serrate. Flowers erect, crowded, white, becoming yellow, fragrant. Sepals caducous, pubescent internally. Styles short. Stigmas recurved.

Very little is known of this plant

True Tea
Plant.
244*C. theifera*, Griff, *Natut IV*, 558, t 601, *Fl. Br. Ind.*, I., 292

TEA, *Eng*, *Thl.*, *Fr*, *Tsl*, *Germ*, *Te*, *Dutch*, *It*, *Sp.* & *Scotch*, *Chai*, *Rus* & *Turk*

Syn.—*THEA SINENSIS* (CHINENSIS), Linn; *THEA BOHEA* (black tea) and *T. VIRIDIS* (green tea), *CAMELLIA THEA*, Link; *THEA ASSAMICA*, Martens, in *Jour. Agri-Hort Soc.*, Ind., III (1844), 63; *ASSAM TEA*, Wallich in *Jour. A Soc.*, Beng., IV, 48, t 2, *CAMELLIA*, Sp., Griff, in *Trans. Agri-Hort Soc.*, Ind. V (1838), t 8

DeCandolle (Orig. *Veget. Ind.*, XXI), 337, *Thea*, while *Haillon* & *de Camellia* The *Genera Plantarum* of referring the Tea plant and

entirely set as *Te*, *c* origin but the west of dean, Coc

alany other words, reached

ERS, and HIND, *Chai* *Rata tekola* (according

The Tea-plant.

CAMELLIA
theifera.

to Moon) is the Ceylon name for *Thea bohea*. Balfour enumerates the following names said to be Chinese: *Ming-tutu, tu, ku-cha, kia, sheh*, and *chuen*, he further mentions the following Indian vernaculars, but these would appear to be tea garden names of a modern origin—*Dullicham* (white wood), *CACHAR*; *Phlap* or *thlap*, *misa phlap* (in Muttack); *Hilkat*, ASSAM.

TEA.

References.—In addition to the publications quoted above (under botanical synonymy &c., may be consulted in order of date of the beginning of the present century.

Bibliography
of Indian
Tea.

245

10.

Thea, in *Royle's Ill.*, 125, 1839.

Tea in Himalaya, Royle in *Prod. Res., Ind.*, 257 and 393, 1840.

Tea in Java, *Cultivation and Manufacture of*, Translated from the Dutch, by J. Horsfield, 1841.

Tea in Robinson's Account of Assam, 1841.

Cultivation of Tea on the Himalaya, a lecture delivered by Dr. J. Royle, at the Royal Asiatic Society, 4th April 1844.

Tea, Report on the Cultivation and Manufacture of Tea in Kumaon and Garhwal by Dr. W. Jameson, 1843-45 (see also *Four. Agri-Horti. Soc. Ind.*, II and IV.)

by Dr. W. Jameson, 1843-45, 401).

tion of, also Tea-seed from W. Jameson, Agra, 1852 II. 60, 233; London, 1852.

Tea Districts of India and China, by

Tea in the Kangra District, by Dr W. J.

Vol. I (Nos 1 to 6), p. 287, 1853)

Tea trade of Russia by Lambey, 1867.

Tea, in *Baden-Powell's Pb. Prod.*, 275.

The Tea-plant.

Tea in *Amer. Fl., Med. Sci.*, April, p. 525; Oct., p. 260; 1868.
Tea, State and Prospects of—Report by the Commissioners appointed to enquire in Assam, Cachar, and Sylhet, 1868 (*Beng. Govt.*)
1-35, 1867).
n—Report
(*Scl. Rev.*,
N.-W. Prov., V. (2nd series), 422 to 433).
Tea in the Nilghiris by Dr. G. Bidie, Report of Coffee Borer, p. 86, *Mal. Govt.*, 1869.
Tea Plantations in Kumaon by Dr. G. King (*Scl. Rev., N.-W.-P., II.*)
Tea
Gardens in Assam, Cachar, Sylhet, and Darjeeling, regarding, 1870.
Tea, in Hassal's Food, The Detection of Adulter. of, 1871 (also 1876).
Tea Pruning, Remarks on, by Dr. G. King, 1871.
Tea, Ure's Dict. of Arts, Man., &c., III., 870; London, 1872, also Supp. IV., p. 874.
Tea, Prize Essay on Cultiv. of, *Agri.-Horti. Soc. Jour., III., Part 2*, 1872.
Tea Operations in Assam, Report on, 1873-74.
Tea Cultivation in Bengal and Assam, Report on, by J. W. Edgar (*Bengal Govt.*, 1873; *Parl. Paper, C. Pt. I.*, 982, London, 1874).
Drury, *Useful Plants of India*, pp. 422 and 477, Ed. of 1873.
Allen, *Pharm. Journ.*, 1873 (also in *Chem. News*, Vol. XXX., 1874).
Camellia Thea, *Link.*; Brandis, *For. Fl.*, 25; 1874.
Tea, Coffee, and Cocoa, by Wanklyn, London, 1874 (also *Chem. News*, XXVIII., 186).
Thea, *Ferninger, Man. Gard.*, 416; Calcutta, 1874.
Brick Tea, *Scl. from Jour. As. Soc., Beng.*, Vols. I. to XXVIII, 825; Mad., 1875.
Dr. Campbell Brown on Tea in *Journ. Chem. Soc.*, p. 1217; 1875.
Thea, in *Baillon's Nat. Hist. Pl.*, IV., 235; 1875.
Tea Culture in Nilghiris by Dr. W. B. Robinson, Report
Tea, by P. L. Simmons, *1rop. Agri.*, p. 79; London, 1877).
Tea in Assam by S. Baildon. Calcutta, 1877.
Tea Culture, Indian, by Burrell, *Jour. Soc. of Arts*, XXV., 199; 1877.
E. Money, *Cultivation and Manuf. of Tea*, 3rd Ed.; London, 1878.
Watson, Dr. J. F., Prize Essay.
Tea, Cultivation of, in Kumaon, by J. H. Batten, in *Jour. Roy. As. Soc.*, X., 131, also in *Jour. Agri.-Horti. Soc. Ind.*, V., Pt. IV.; 1878.
Tea Culture as a probable American Industry, by W. Saunders, 1879.
Camellia Thea, in Bent, and Trim, *Med. Pl.*, I., 34; London, 1880.
Chinese Tea Plant, in United States Agri. Report, 1877, p. 363; 1879, p. 27; 1881, p. 81 (as an insecticide).
Camellia Thea *Link.* *Man. from Forest Trees*, Plate 59.
Calcutta, 1881.
Calcutta, 1881.
Tea, Smith, *Dic. Econ. Pl.*, p. 404; London, 1882.
Capabilities of New Zealand for Tea Culture, by W. Cochran, in *Jour. Soc. Arts*, XXX., 1882.

CAMELLIA
theifera.

The Tea plant.

TEA.

from those of China," it has been established beyond doubt that one if not two forms of the true tea plant occur in certain forest glades of Assam (Jaipur, Sudiya, &c.) and Cachar, the supposition that they are either native or have become acclimatised as escapes.

cultivation In Manipur (a small Native State between Assam, Cachar, and Burma) the plant exists as a forest tree in such profusion as to leave no possible doubt that it is truly indigenous. It is not worthy that Manipur occurs in the very latitude to which many authors fix the possible Chinese wild home of the plant. It is, perhaps, desirable, the meaning being put upon Mr De Cane's extended meaning being put upon Mr De Cane's.

a whole. The species extends furthest to the west is *C. drupifera*, which is not met with in Nepal, and from there distributed east along the border to the west of the Khásia and Cachar of Burma, and again south of Assam and Cochin China.

C. theifera would appear to flourish in Assam, from which region it is distributed along the border to the west of the Khásia and Cachar and Sylhet and Tipperah in South India.

Shan Wet
Tea
247
(Conf with
251)

extends even as far south west as the Shan tribes bordering on Manipur do cultivate the plant, and manufacture it into a form of wet tea. This is packed in South Western

decoction, but is eaten as a preserve. The Western Tibetans boil tea with flour and butter and eat the mixture like a pudding, a habit somewhat similar to that followed by the Shans and Burmans of eating tea as a preserve instead of making a decoction from the leaves. The Shans have been known to manufacture this peculiar wet tea from almost time immemorial. One of the earliest Government records of this fact will be found in a report by Colonel Hannay on Bhama and on the capacity of the Shan Countries (dated January 1836, but reprinted in *Sel Rec, Beng Govt*, XXV, 1857). Various early accounts also exist of a trade in tea between Assam and Burma with

Yunnan Tea.
248

but there seems little doubt the true tea plant is now, and has been, that province of China. No doubt China have referred to the title or no mention of the plant Chinese side of the line indicated except at the extreme corner or in regions more or less adjacent to Manipur. It is a common opinion, as to the home of the tea plant, that the mountainous tract which separates the plains of India from the Chinese side is too extended. The plant in all portion of the extreme easterly division of that mountainous tract, and further, as already remarked, as far as we have any direct evidence to bear on the question, it exists on the Indian and not on the Chinese slopes. Far away to the east perhaps several hundred miles from the tea forests of Manipur, in South Eastern China, the great tea districts of China occur. We know very little indeed of tea in the intervening tract of rich mountainous and agricultural country. In the province of Si Chuen several travellers have

The Tea plant.

CAMELLIA
theifera.

reported tea as being found in an irregular state of cultivation. Cooper (*Trav. Pioneer of Commerce, page 171*), speaking of the flourishing city of

TEA.

he city and thousands of Ta-tsiang-ured grows which pro-

A Tea Tree in
Western
China.
249

duces the tea exported to Europe, is a tall tree, often fifteen feet high with a large coarse leaf." This is very much like a description of the so-called indigenous Assam tea plant, but it recalls also in some respects the late unfortunate Captain Gill's description (*River of the Golden Sand*) of a curious tea plant (also grown in Western China) but which cannot possibly, from his description, be a species of *Camellia*. It would be worth knowing for certain if the brick tea of Western China, so largely exported to Lhasa and other parts of Tibet, be actually made from the leaves of a different plant from the ordinary tea of China. We

Brick Tea of
Western
China.
250

latitude. It is frequently found growing in regions subjected to a short but severe snowy winter, a fact which seems to have greatly influenced Royle and the other earlier advisers of the Government of India in selecting the Himalayan sites for experimental tea cultivation. Localities were actually selected where short snowy winters might be secured, and

Region of
Chinese Tea
Cultivation.

occur (Assam)
The Manipur tea forests are found on the mountains which separate the valley of Manipur from Burma and approximately between 24° and 25° North latitude. But the writer saw tea in the forests far to the north-east of Manipur, near the lofty mountains of Sarameti.

Region of
Indian Tea
Cultivation.

is much wider. It occurs in the ar 33° North latitude, and in South 1° North latitude. It has also been

to view it as introduced into Assam and Cachar. He would even venture the suggestion that the crude mode of burying the tea leaf in the ground so as to produce the required fermentation, as practised to-day by the Shans in Upper Burma and on the borders of Manipur, may be the

Probable
History of the
habit of Tea
Drinking
(Conf. with
247)
251

CAMELLIA
theifera

The Tea plant.

TEA

the Tibetan method of eating the tea leaves after they had been boiled in flour and butter. From this one might be pardoned drawing on imagination still further by supposing the enlightened Chinese to have improved the process of manufacture and to have refined the method of cooking by preparing an infusion from the leaves instead of eating them. As partly supporting this theory we have the astonishment expressed by several of the earlier writers that the Chinese only pour boiling water over their tea and do not cook the leaves. A large trade in Cardamoms exists between the capital of Kashmir and the neighbouring hill tribes who employ these to flavour their decoction of tea in place of the sugar used by the people of the west. Major Ward informs the writer that he has seen the chenherds of that race smoke tea instead of either eating it or drink. The planter writes to the author tea to smoke in place of tobacco, and that although it seemed inferior stuff he was not able for some time to detect that it was tea and not tobacco that he had been actually smoking.

Smoking Tea

The Spread of
Tea Cultiva-
tion
252

The stirring national migrations of the early inhabitants of Eastern Asia through the Burmo-Chinese regions, and the early trade-route which became established, with the more settled condition of the people, might easily be supposed to have carried the tea plant at an early date to China and to India more recently by the Siam invasions. As opposed to all this it may be urged that there are references to tea in Chinese botanical works (or to what appears to be tea) at a date prior to any known migrations from Burma to China or from China to Burma or Siam. But in none of the very early supposed references to tea is mention made of eating the leaves as pickle or after being cooked into pudding or of making a beverage from them by means of boiling hot water. May not the tea plant therefore or some allied *Camellia*, have been cultivated in ancient China for a perfectly distinct purpose to that for which it is now grown? This line of reasoning is only on a par with the fact that down to mode having to

Bota

found in high latitudes or high altitudes but in warmer regions, such as in the damp forest glades of Assam and Cachar, and in the tea forest of Manipur, often becoming a tree from 30 to 50 or even 100 feet in height. Leaves variable, especially when cultivated, generally tapering at both extremities, elliptic oblong, acute or cuspidate-acuminate, puberulous on the nerves below, 4 to 8 by $1\frac{1}{2}$ to $2\frac{1}{2}$ (in the wild plant often 12 to 15 by 4 to 6) inches in size. Flowers white, solitary, pendulous. Sepals persistent. Styles united for about $\frac{1}{3}$ of their length.

Improvement
of Tea stock
253

In some of the cul-
the leaves small, and
degree of hybridisation

investigation. Indeed, it may be repeated, with the greatest assurance that the time has now come for the planter to devote a greater share of his time and attention to the study and improvement of his plant stock than has hitherto been done.

CHINA TEA.
254

THE HISTORY OF THE CHINA TEA

There is every reason to believe that, although the habitat of the tea plant may be somewhere on the Assam-Burman and Chinese frontier, the practice of preparing a beverage from its leaves existed for centuries in China before it was known in India. Apparently classical scholars have failed to find any allusion to the plant or to the beverage in the

The Tea-plant.

CAMELLIA
theifera.

works of the early Sanskrit, Arabic, and Persian writers. Tradition from India to China, but is told by the Japanese In his interesting little *ancient Books*) Dr. Brets- a writer as early as 2700 is fact, adds (in the 4th century A D) that by means of hot water a beverage is obtained from the leaves of the plant.

TEA.

The Beverage
made in China
in the 4th
Century.

Thus the literature of China allows of little doubt as to the beverage having been known in that country at least since the 4th century, and very possibly from a much earlier date. According to most writers it began to be systematically cultivated in South-Eastern China about that period, and we have a definite reference to the industry in the annals of the T'ang Dynasty, 793 A D., where allusion is also made to the article having been subjected to an imperial duty. Macpherson (*History of European Commerce with India*) remarks that Soliman, an Arabian merchant, wrote an account of his travels in the East about A D. 800 d w t g a

Japan in the
9th Century.

is claimed, however, by some authorities for i been first shown in Amsterdam and thence s authentic European notice of tea occurs in Marco Polo, the first time it is mentioned of the beverage fr *History of* "have an

as a drink instead of wine," and he infers, perhaps correctly, that this was tea. Texeira, a native of Portugal, is reported to have seen the dried leaves of tea in Malacca in the year 1600, and Olearius found tea being used in Persia in 1633.

Perhaps the most amusing and at the same time instructive incidents in the history of tea are recorded in the proceedings of the East India Company (see *Misburn's Oriental Commerce*). An officer of the Com- 5, asking for "a pot of Probably the earliest Company is to be had in an entry in the Company's books in June 1664 of having presented the King with 2 lb and 2 oz of "thea," which cost 40s a lb. Two years later the Company appears to have been more liberal, for a second present to His Majesty is recorded —

Tea was in
use in
England
in the 17th
Century.

£ s. d.
"22½ lb of thea at 50s per lb 36 17 6
For the two chiefs persons that attend His Majesty, thea : 6 15 6"

Not, however, until the year 1677 did the East India Company take steps to secure a regular and commercial supply of tea. The order the London Directors then issued was "for teas of the best kind to the amount of 100 dollars." This order seems to have been exceeded, and the market accordingly glutted, for we next read of complaints regarding the excessive consignment of 4,713 lb made in 1678 (see *Macpherson's Hist. European Com with India*, p 131). Tea sold in London about this period at from £5 to £10 sterling a pound. Shortly after (1657) cups of tea began to be sold in the public coffee-rooms of London, especially at

Commercial
supply in
1677.

Imports
4,713 lbs.

CAMELLIA
theifera.

The Tea-plant.

TEA.

"Garraway's," and a duty was claimed from the vendor of 8d. a gallon. In *Pepys' Diary*, under date of 28th September 1660, there occurs the entry: "I did send for a cup of tea (a China drink) of which I had never drank before." Yule-Burnell, in their *Glossary of Anglo-Indian Terms*, give numerous other passages from early English writers in which mention is made of tea down to the year 1789.

A duty levied,
1689.

The first direct duty levied on the sale of tea was in the time of William and Mary (1689); it was then subjected to a tax of 5s. a pound and 5 per cent. on the value of the article *ad valorem*. This is perhaps the heaviest duty to which it has ever been subjected. As a result the
what is noteworthy
from Madras and
the 17th century

Tea Monopoly.

20,000lb. It is important to add that the East India Company had secured for themselves from the British Parliament the concession of being the only merchants allowed to import tea, and for nearly 180 years they enjoyed this monopoly, free trade in tea having only been allowed as late as 1833.

In 1703 the imports into Great Britain amounted to 105,000lb, and the article was sold at 16s. a lb. In 1704, the Chinese, imitating the monopoly granted by the British Government to the East India Company, endeavoured to establish a Chinaman as the Emperor's merchant who alone would be permitted to sell tea to the Company. This auda-

10 per cent. (*Audon on China*, p. 150.)

Imports
1,000,000lbs.

In 1721 the imports into Great Britain of tea amounted to 1,000,000lb, and seven years later they had increased by another 100,000lb, the revenue therefrom having been £104,300. From 1722 to 1744 the duty was fixed at 4s. a lb excise, with, in addition, a customs due of 14 per cent. Macpherson has estimated that this amounted to 200 per cent. on the

Adulteration.

there is perhaps no other article of food that is so little adulterated.

During the 100 years from 1710 to 1810 the aggregate sales of tea by the East India Company amounted to 750,219,016lb, valued at £129,804,595 sterling, and of that amount 116,470,675lb were re-exported to other countries. At the present day Great Britain consumes in three years as

The Tea-plant.

CAMELLIA
theifera.

TEA.

they were 2,360,000lb and gave an annual revenue of £318,080. This extremely favourable result, instead of suggesting the advisability of

adulteration were of course renewed with greater energy than before. But in 1784 the duty was again reduced to 12½ per cent. For the three

The result was that during these 25 years the sales stood stationary at an average of 21,000,000lb and yielded an average revenue of 2½ million pounds sterling. The restriction in the sale of tea thus caused was greatly increased by the fact that the East India Company still retained its charter as the sole importers of tea, but in April 1834 a new state of affairs began to dawn. An Act of Parliament had abolished the East India Company's monopoly, and free trade considerably lowered the initial price of tea. At the same time the *ad valorem* duty was abolished and differential rates established, and all "bohea teas" were subjected to a customs duty of 1s. 6d. a lb, the better qualities of tea paying 2s. 6d. to 3s. a lb.

Revenue
£2,500,000.Removal of
Tea Monopoly.
1834.

In 1836 the duty was again altered to a uniform charge of 2s. and 1d., which rate, with the addition of 5 per cent. imposed in 1840, prevailed till

it was again reduced to 1s. and 5d., and in 1864 to 1s., and was finally fixed in 1867 at 6d. a pound, at which rate it still remains. Coincidentally with the reduction of duty occurred an equally important consideration—a fall in the price of the article. About the middle of the 17th century a pound of good tea cost in London as much as £10 sterling; at the present day a better article may be purchased for 2s. and 6d. a pound.

Present duty
6d. a lb.

Price of Tea.

The writer has purposely passed over, in their chronological places, the incidents connected with the history of the Indian tea industry, deeming it desirable to give, in the first place, a succinct account of tea as a whole, and then to treat of India by itself. By way of concluding this part of the history of tea, it may be repeated that, at the beginning of the 18th century, the imports of tea into Great Britain were only 20,000lb, but that in 1885 they amounted to 212,375,371lb, and were in 1883 even still higher. These facts forcibly illustrate the growth of the habit of tea-drinking during the past two centuries, and it is somewhat remarkable that this taste should have developed almost exclusively amongst the

THE HISTORY OF THE INDIAN TEA INDUSTRY.

Difficulties with China early began to make the British Government realise the danger of having no other source of tea than China. Ultimately the whole energies of the Chinese section of the East India Com-

INDIAN TEA.
255

CAMELLIA
theifera.

The Tea-plant.

TEA.

Tea in
America.Tea seed sent
to India in
1780.

pany were concentrated in the tea trade. Friction with the Company soon gave vent to loud outcries in England which were re-echoed by the disaffection of America. Tea in fact became intimately connected with the severance of the American Colony from the Crown of England. Colonists, disguised as Indians, boarded taxed tea and threw it over-board; open rebellion. The taxation of tea and in a half-hearted way the East wish of the Government that India. Seed was accordingly

fact of considerable interest,
anic Gardens, Seebpore, near
of horticulture in India, and

one of the earliest botanists of whom we have mention, has a fitting memorial in the centre of the Seebpore Gardens. Reporting on his tea experiments he wrote to Sir Joseph Banks pointing out that the neighbourhood of Calcutta did not seem the most suited locality. In reply Sir Joseph, in 1788, addressed Warren Hastings as to the desirability

Discovery of
Tea in India.
1810-1821.

Assam, discovered tea there; by others he is said to have received the plant through native agencies from Manipur. According to Balfour, he addressed Mr. G. Swinton, the then Chief Secretary to the Indian

The writer
ords of the
corded from

Assam or from Manipur is almost immaterial. There seems no doubt
whateve
existenc
to have
already

Gold medal
of the Society
of Arts

and is now, it would
Society's Rooms,

ies to secure some
taking the matter
produce the best
hus awakened, but
years passed before any one claimed the medal. In 1826 the brothers
Bruce, inspired by Scott according to some authors, and acting inde-
pendently according to others, rediscovered the tea plant in Assam; in
consequence Mr. O. A. Bruce was awarded the Society of Arts' gold
medal; he also obtained, from the Indian Government, a grant of land
d in the
iscoverer
Society
as been
of these

The Tea-plant.

CAMELLIA
theifera.

TEA.

Operations
commenced.

pioneers, but there seems no doubt whatever that Major (and possibly also Mr.) Bruce, had prior claims to Charlton for being the re-discoverers of the indigenous tea of Assam.

About the time these discoveries were being made in the then (to Europe at least) *terra incognita* of Assam, animated discussions were taking place in England which ultimately culminated in the overthrow of the East India Company's monopoly. Lord William Bentinck, then Governor-General of India, took up warmly the matter of Indian tea cultivation. A committee was appointed, with Dr. N. Wallich as Secretary, to report on the situations best suited for the experimental cultivation of China tea in India. Drs Wallich and Royle urged that the experiment should be first made at Kumáon, on the Himaláya, being guided by a consideration of the latitude, climate, soil, and vegetation of South Eastern China closely agreeing with certain portions of the Himaláya. One of the first acts of the committee was to despatch Mr. G. J. Gordon to China, in order to collect information regarding every feature of the Chinese cultivation and manufacture of tea, and to bring away plants and seed. That gentleman had scarcely commenced his enquiries when he was recalled by the announcement that the tea plant had been found in Assam. Captain (afterwards General) Francis Jenkins had become Chief Commissioner of Assam, and he went with energy into the Bruces' discovery of tea. Had Mr. Scott's still more early discovery received even a passing consideration, Mr. Gordon would, in all

first refused to accept General Jenkins' plant, as being the true tea-yielding species, a fact which he appears to have deposited

given him. In consequence of the identification of the Assam plant, a commission was appointed in 1836, consisting of Drs. Wallich, McClelland, and Griffith to visit Assam and report on the tea said to be found there. One of the most curious results of this commission was that the reiteration of the opinion that the Himalayan localities, formerly recommended, were preferable for experimental tea cultivation, and after those Upper Assam, and last of all the mountains of South India. They, however, concluded that it would be desirable to open out one garden in Assam, but recommended that the China plant and not the degenerated Assam plant should be tried. Drs Wallich, Royle, and Falconer continued almost to the last to contend that the Himalayan localities would be preferable, but the claims of Assam were eventually recognised and urged by Drs McClelland and Griffith.

Experience has tended to show that the China plant grows better on

Tea
Commission
appointed,
1836.Himalayan
Gardens
recommended

opinions given were correct, for Drs Wallich, Royle, and Falconer were strong advocates for the pure China plant, and the localities selected by them for that plant were certainly preferable to the hotter and damper regions of Assam.

By 1834 the plants raised in the Calcutta Botanic Gardens from the seed brought from China by Mr. Gordon were ready for issue to Kumáon, and were placed under the charge of Dr Falconer, who had now succeeded Dr. Royle as Superintendent of the Saharanpur Botanic Gardens.

Seed sown
in the
Calcutta
Botanic
Gardens;
plants sent
to Kumáon.
1834

CAMELLIA
theifera.

The Tea plant.

TEA.
First Assam
Garden,
1835.
Indian Tea
sent to Eng-
land, 1838.

In 1835 the first experimental plantation in Assam was opened up by Government in Luckimpore, and in 1839 the first commercial sample of Indian tea was forwarded to England; it amounted to 483 lb. and the plants were removed to Jyppur in 1840 sold to the Assam Company, the first tea concern, and very much the largest Company in India. It was anything but prosperous during the first 15 years of its existence, and its shares fell so low that they could scarcely be sold. About 1852 its prospects began to improve, and with its success the tea industry appeared so promising and attractive, that speculators eagerly rushed into it. In 1851 the imports of Indian teas into England amounted to nearly $\frac{1}{2}$ million pounds. In 1855 indigenous tea was discovered in Cachar, and in the following year it was found by Mahomed Warish in South Sylhet (*Beng Govt Sel*, XXV., 45). Previous to this (in 1853) attempts had been made to cultivate tea in Darjeeling, but the industry was not fully started there until 1856-57. Various attempts were made between 1835 and 1840 to introduce tea into Southern India, but little interest was taken in the experiments previous to 1865 (*Robertson's Rep.*, Nilgiri Dist., 1875, 31).

In Chittagong and Chunar Nagpur tea cultivation was started about 1862-67. Ultimately tea cultivation spread over every district in India, where there was the least hope of success, but with a rapidity that was certain to culminate, as it did in the great disaster of 1865-67. It is need less to dwell on the causes of that disaster, but the reader is referred to Mr Ware-Edgar's excellent and full report (*Reprinted as a Parliamentary paper*, C 982, 1874). It may briefly be characterised to have been the result of reckless impetuosity, ignorant supervision, and positive dishonesty. Fortunes were made by the few who realised that the tide would turn. The better-situated gardens were purchased for fewer rupees than they had cost pounds sterling to construct. New companies were formed to work these gardens, and with the avowed purpose of growing tea for its own merits as a commercial article and not for the purpose of selling their gardens at a profit whenever popular favour returned to tea investment. Out of these trying times the industry rose on a firmer foundation, and the prosperity that has attended the labours of the planter has been recently and fittingly told by Dr J Berry White in the *Journal of the Society of Arts*. Dr White has shown that the heavy expenditure on cultivation and manufacture has been so effectively reduced (and that it may be even still further lowered) that all fear of competition with China may be said to have been removed. But while this is so many planters hold the opinion that a danger exists in the outcry for reduction, since the point may be thereby reached of defective cultivation. China, once supposed an insurmountable obstacle to the Indian planter, has, however, been practically vanquished, for within the past few months India combined with Ceylon has been leading the market. Thus in little more than half a century India has come to supply half the world's demand for tea, and there is no reason to suppose that she has by any means reached her highest level. The latest returns show the shipments from China for this year as 30 million pounds below those of the preceding year. Hitherto the attention of the Indian planter has been directed to compete with China in the London market, while all the time the imports into India of cheap China teas have been steadily increasing. The time has now come when the Indian planter, to extend his trade, must consider the requirements of new markets.

By way of strikingly illustrating the growth of the Indian tea industry the following table has been compiled from various trustworthy sources

C. 255

Tea Disaster,
1865-67.

Growth of
Indian Tea
Trade.

The Tea-plant.

CAMELLIA
theifera.

TEA.

The British Government commenced to record separately Indian teas in 1852, but the table has been drawn up from 1864-65 to 1885-86. Briefly, it may be repeated the exports from India were in 1838 declared to be 488lb, while in 1886 they had attained the proportion of 68,784,249lb.

YEAR.	1	2	3	4
	Quantity ex- ported to all countries from India in lb.	Value of the same in Rs.	Imports into Great Britain of Indian tea (from 1873 including Ceylon) in lb.	Per centage of Indian to China teas consumed in Great Britain.
1864-65	3,437,437	29,07,840	2,310,000	3 to 97
1865-66	2,755,187	27,50,550	5,133,000	4 to 96
1866-67	6,397,088	36,03,268	7,084,400	6 to 94
1867-68	7,311,429	68,69,280	8,132,400	7 to 93
1868-69	11,450,213	95,13,764	10,445,320	10 to 90
1869-70	12,754,022	1,03,78,830	13,145,900	11 to 89
1870-71	13,232,232	1,12,05,167	13,351,600	11 to 89
1871-72	17,187,318	1,45,49,846	16,942,000	13 to 87
1872-73	17,753,911	1,57,76,907	18,424,000	15 to 85
1873-74	19,324,235	1,74,29,256	17,377,000	13 to 87
1874-75	21,137,087	1,93,74,292	25,605,100	16 to 84
1875-76	24,391,597	2,10,64,108	25,605,100	17 to 83
1876-77	27,784,124	2,60,74,251	29,383,700	19 to 81
1877-78	33,459,075	3,04,45,713	31,883,300	23 to 77
1878-79	34,437,573	3,13,84,235	36,007,100	22 to 78
1879-80	38,174,521	3,03,10,200	38,433,700	28 to 72
1880-81	45,413,510	3,05,42,400	45,764,000	30 to 70
1881-82	48,691,723	3,60,91,353	54,080,300	31 to 69
1882-83	57,766,225	3,60,94,963	61,666,500	34 to 66
1883-84	59,911,703	4,08,38,805	65,731,600	37 to 63
1884-85	64,162,033	4,04,47,592	68,159,600	39 to 61
1885-86	68,784,249	4,30,61,335	76,585,000	41 to 59

[Note: The above table is based on the data provided in the original document. The values for the years 1873-74 to 1885-86 are derived from the original text, which shows a general increase in both quantity and value over time, with a slight dip in 1879-80 and 1880-81.]

it in the year
paying a total
under tea and

Oil.—Tea-seed oil has already been alluded under *Camellia drupifera*, and it is only necessary to add that as this substance figures largely in Chinese and Japanese commerce it is commended to the attention of tea planters as a biproduct that might be worthy of their attention. (See *Spons' Encycl.* p. 1411.) An essential oil is also distilled from the leaves, quite distinct from the fatty oil.

OIL
256

The reader is referred to another volume under TEA for an account of the Methods of Cultivation and Manufacture of Tea and for other information regarding the Commercial Article, its Chemistry, Adulteration, and Trade Statistics.

Camphire, the sweet-smelling Camphire of Solomon, is, according to some authors, the *Henna* of Indian writers; see *Lawsonia alba*, *Lamk*, *LYTHRACEÆ*. Camphire is by other writers a synonym for Camphor.

CAMPHOR.

Forms of Camphor.

257

Camphor.

CAMPBOR, *Eng.*; CAMPHRE, *Fr.*; KAMPHER, KAMPFER, *Germ.*; CAMFORA, *It.*; ALCANFOR, *Sp.*

Vern.—*Kasur*, *kapur*, *ghausar*, HIND; *Karpūr*, *kāpūr*, BENG; *Karpura*, *kapur*, MAR.; *Kapur*, *karpūr*, GUJ.; *Kapur*, *DUN.*; *Karpūram*, *kapūram*, *shudan*, TAM; *Karpūram*, TEL.; *Kappūram*, *kaporbarus*, *kapur*, *kasur*, MALA.; *Karpūra*, *KAN.*; *Karpūra*, *chandrahba*, SANS.; *Kāf-r*, ARAB., PERS; *Pa-yōk*, *payo*, *pyo*, *parouk*, BURM.; *Kapuru*, SING.

References.—*Roxb. (Shorea)*, *Fl. Ind.*, Ed. C.B.C., 440; *Pharm. Ind.*, 190; *Camphor of Sumatra*, by J. Macdonald, Esq., in *As. Res.*, Vol. IV, pp. 19–33; *Mason's Burma*, 483; *Flück. & Hanb.*, *Pharmacog.*, 510–518; *U. S. Dispens.*, 15th Ed., 330; *U. C. Dist.*, *Mat. Med. Hind.*, 222; *Dymock*, *Mat. Med. W. Ind.*, 2nd Ed., 93 & 665; *Ainslie*, *Mal. Ind.*, I., 538; *Waring*, *Basar Med.*, 32; *Year-Book of Pharm.*, 1873, p. 97; *Spons.*, *Encyclop.*, 571–778, 796, 1624; *Balfour*, *Cyclop.*, Ed. 1885; *Treasury of Botany*; *Ure*, *Dic. of Arts and Manuf.*; *Kew Official Guide*, *Bot. Gardens and Arboretum*, 120, 125.

Camphor.—The name 'Camphor' is applied to various concrete, white, odorous, and volatile products, all of vegetable origin and possessing similar properties. They would appear chemically to be secondary formations from the volatile oil of the particular plant from which they are derived. A number of plants belonging to widely different families are accordingly found to yield this substance. Of these, however, three may be regarded as important, but only one of these commercial at the present day.

FORMS OF CAMPHOR.

FORMOSA.

258

1st.—The FORMOSA or CHINESE CAMPHOR, and JAPANESE CAMPHOR. This is the most important—the commercial form of Camphor. It is prepared as a crystalline substance, deposited on cooling, from a decoction made from chips of the wood boiled by a process very similar to that adopted in the manufacture of catechu. The tree which affords this substance is known as the Camphor laurel, *Cinnamomum Camphora*, *F. Nees*, of the Natural Order LAURINÆ, a plentiful tree in the interior of the island of Formosa, in Japan, and throughout Central China. The bulk of the Camphor from these countries reaches Europe from Canton, and is called by the collective name of Chinese Camphor; but a small portion, which serves that name, from the fact of its being

obtained on the mainland of China, is known as the mainland of China Camphor. The Camphor of Formosa, but is prepared in the same manner as the mainland Camphor, in the belt of debateable territory which separates the Chinese possessions from the interior. Recently, through the action of the Chinese authorities, the Formosan trade in Camphor has been almost entirely ruined, and the reports of the London drug marts rarely, if ever, now mention this once valued Camphor. In Japan, the plant flourishes throughout the three principal islands, but the extract is chiefly prepared in the province of Tost in Sikok, the mild damp sea-air of that island being apparently favourable to the growth of the tree. In the districts of Satsuma and Bungo a considerable amount of Camphor is also manufactured.

BARUS.

259

2nd.—The BARUS CAMPHOR (from Barus, a town in Sumatra), also known as KAPUR BARUS, BORNEO CAMPHOR, and MALAY CAMPHOR, and, in the Indian Trade Returns, as BHIMSINI or BARAS. It is obtained as coarse crystals, formed naturally in the stems of *Dryobalanops Camphora*, *Colebr.* (*D. aromatica*, *Gartin*), a tree closely allied to the

CAMPHOR.

History of Camphor.

in addition, a number of other camphors, less intimately related to India, such as NEROLI CAMPHOR, prepared from the flowers of the bitter orange, BERGAMOT CAMPHOR, BARASA CAMPHOR, SASSAFRAS CAMPHOR, and ORRIS CAMPHOR.

In India, in addition to the species of *Blumea* above enumerated as yielding Ngai Camphor, there are many plants which smell strongly of camphor, some of which would most probably be found to yield that substance. Among these may be mentioned the common aquatic weed of the plains of Bengal, *Limnophila gratioloides*, Br., the *Karpur* of the Bengalis; and also the numerous species of aromatic *Blumeas*, some of which have already been alluded to.

HISTORY.

History of Camphor.—Having now very briefly discussed the sources of the various kinds of Camphor, it may not be out of place to say something here of the history of that substance. The authors of the *Pharmacographia* inform us that there is no evidence that Camphor was known to Europe during the classical period of Greece and Rome. The first mention of the substance "occurs in one of the most ancient monuments of the Arabic language, the poems of Imru-i-Kais, a prince of the Kindah dynasty, who lived in Hadramaut in the beginning of the sixth century." About this period no mention occurs in Chinese writings of Camphor, although the tree was well known and the timber described. In the thirteenth century Marco Polo saw forests in Fokien, South-Eastern China, of the trees which give camphor (*Yule, Book of Ser. Marco Polo, II (1871), 185*). It was not, however, until Garcia de Orta in 1563 pointed out that the Camphor of Europe came from China, that the existence of the two forms

was known. The earlier Arabian writers all clearly refer to Java, which, even at the present day, is

China. In the sixth century, Borneo Camphor, the most expensive of perfumes. "Ishak ibn Anna, a physician living towards the end of the ninth century, and Ibn Khurdaubah, a geographer of the same period, were among the first to point out that camphor is an export of the Malayan Archipelago, and their statements are repeated by the Arabian writers of the Middle Ages, who all assert that the best camphor is produced in Fansur. This place, also called Kunsur or Kausur, was visited in the thirteenth century by Marco Polo, who speaks of its camphor as selling for its weight in gold (*Flück & Hanb, Pharmacog.*).

Yule and Burnell, in their *Glossary of Anglo-Indian Words*, inform us that the *Kansur* and *Kafur-i-Kansur* of some authors is the result of the perpetuation of a blunder, "originating in the misreading of loose Arabic writing. The name is unquestionably *fansuri*. The Camphor *al-fansuri* is mentioned as early as by Avicenna and by Marco Polo, and came from a place called *Pansur* in Sumatra, perhaps the same as Barus, which has long given its name to the costly Sumatran drug."

The uniformity of the name Camphor, or some transparent derivative from a common root, shows that the substance was procured originally from one place, and it seems abundantly demonstrated that the Camphor first known to the world was that obtained from *Dryobalanops Camphora*, and not the Camphor of modern commerce, which is prepared from the wood of the Camphor laurel tree. U. O. Dutt mentions the fact that two sorts of Camphor are referred to by Sanskrit writers, "namely, *pakva* and *apakva*, that is, prepared with the aid of heat and without it. The latter is considered superior to the former. It would seem from the above description that by the term *apakva karpura*, was probably meant the

Trade Returns and Commercial History.

CAMPHOR.

HISTORY.

Camphor obtained from Borneo from the trunk of *Dryobalanops aromatica*; and by the term *pakra karpūra*, the China Camphor obtained by sublimation from the wood of *Cinnamomum Camphora*" (*Hindu Mat. Med.*, 222) Dr. Dymock, in his *Materia Medica of Western India*, also accepts this opinion regarding the two kinds of Camphor mentioned by the Sanskrit writers. The fact that the earliest mention we have of the modern Camphor is in the thirteenth century would seem, however, to be opposed to this being the *pakra karpūra* of the Sanskrit writers, and the suggestion may be offered that the boiled Camphor referred to may have been Blumer or Ngai Camphor, a substance which at the period indicated may either have been manufactured in India or imported from China. The history of Ngai Camphor does not appear to have been sufficiently investigated, but it is quite possible that the strongly camphoraceous bush of China and India may have been the first plant resorted to as a substitute or adulterant for the prized Camphor of Sumatra. As a matter of fact, this Camphor is much more nearly related to the Malayan than to the China Camphor, and even at the present day it is ten times the price of the Formosa Camphor, and is extensively consumed in China, partly qualities of Chinese ink. "

as met with in the bar.

Sāratī káfūr, (c) *Chīnī-káfūr*, and (d) *Batāī-káfūr*.

TRADE RETURNS AND COMMERCIAL HISTORY.

TRADE.
263

Commerce.—While some of the less important camphors do, to a limited extent, reach Europe and India, the commercial or Chinese form is that which has been called "Chinese Camphor." The camphor of the East is and limited. It is purer.

It arrives in double tubs (one within the other), without any metal lining. Hence it is sometimes called "Tub Camphor." It fetches a higher price than the Formosa Camphor

ude Camphor, a small
nes in tin-lined cases,

! . . . C . . . : (: , in his Trade Review for 1875-76, gives the following note regarding the relative value of the Barus and China Camphors.—

"Camphor is of two kinds, Bhimsaini or Barus, and the ordinary sort. The first is the produce of the *Dryobalanops Camphora*, and is imported from Borneo and Sumatra, where only the tree is found, *via* the Straits. It is valued in the tariff at Rs 80 per lb, while the ordinary kind, imported chiefly from China, is worth not more than Rs 40 to Rs 65 per cwt. This enormous difference is accounted for by the reputation (scarcely merited) which the Bhimsaini kind enjoys of peculiar excellence." (*Para. 16, pages 9 and 10*)

Of Borneo and Sumatra Camphor probably not more than 2 or 3 cwt. are annually imported into India.

CAMPHOR.

Trade Returns and Commercial History.

INDIAN
TRADE IN
CAMPHOR.

The Import and Re-export trade in Camphor between India and foreign countries for the past seven years was as follows:—

YEAR.	VALUE OF CAMPHOR			
	IMPORTED INTO INDIA		RE-EXPORTED FROM INDIA.	
	Bhimsain or Barus	Other kinds	Bhimsain or Barus.	Other kinds
	R	R	R	R
1879-80	20,909	5,34,001	2,316	23,174
1880-81	22,924	5,53,732	140	26,559
1881-82	38,574	5,52,335	1,640	21,133
1882-83	43,618	8,68,794	529	25,231
1883-84	38,579	6,27,278	790	28,730
1884-85	35,501	6,53,333	270	13,432
1885-86	25,944	6,53,545	Nil.	16,779

In addition to the above, a small amount of Camphor is annually imported. In 1882-83 these imports were noteworthy that a certain amount comes from Great Britain. This is the European refined Camphor found in India—an article far superior to the water-impregnated Indian refined Camphor.

Mr. O'Connor publishes, under the quotations of exports of articles of "Indian Produce and Manufacture," the following figures for Camphor (other than Bhimsain or Barus):—

YEAR.	VALUE	ANALYSIS OF EXPORTS FOR 1883-86	
		Country to which exported	Province from which exported
	R		
1879-80	7,514		
1880-81	7,142		
1881-82	6,510		
1882-83	9,475		
1883-84	6,682	Ceylon 4,905	Bombay 1,607
1884-85	6,135	Other Countries 1,150	Madras 4,448
1885-86	6,055	TOTAL 6,055	TOTAL 6,055

Indian
Refined.
264

t
th
C
P

a peculiar
sible into th
per drum,
crude camphor and 2½ parts of water, the cover is then luted with clay,
and the drum, being placed upon a small furnace made of clay, is also
luted to the top of the furnace. In Bombay four of these furnaces are

Purification of Camphor.

CAMPHOR.

built together, so that the tops form a square platform. The sublimation is completed in about three hours; during the process the drums are constantly irrigated with cold water. Upon opening them a thin cake of camphor is found lining the sides and top; it is at once removed and thrown into cold water. Camphor sublimed in this way is not stored, but distributed at once to the shopkeepers before it has had time to lose weight by drying. It is sold at the same price as the crude article, the refiner's profit being derived from the introduction of water" (*Mat. Med.*, W. Ind., 1st Ed., 540). This same practice seems to be followed at Delhi and at a few other cities in India, but the method is crude and unsatisfactory, when the purified article is compared with that imported into India from Europe. The European process of refining camphor was long kept a secret, and towards the end of the seventeenth century the entire camphor of Europe had to be sent to Holland to be sublimed. A monopoly was also held for some time in Venice, but at the present day camphor-refining is largely accomplished in England, Holland, Hamburg, Paris, New York, and Philadelphia.

In England the impure camphor is broken up and mixed with 3 to 5 per cent. of slaked lime and 1 to 2 per cent. of iron filings. After being well sifted, this mixture is introduced through a funnel into a series of glass flasks, almost completely buried in a sand-bath. Instead of treating these by means of a fire, where flame might ignite the gas given off during the process of sublimation, dishes of fusible metal, kept warm by a furnace below the room, are used. The heat is suddenly raised from 120° to 190° C., and kept at that point for half an hour, so as to expel the water from the camphor. The temperature is then raised to 204° C., and maintained at that point for 24 hours. When the crude camphor has melted, the sand is removed from the upper half of each of the flasks and a paper cork placed in the neck. This allows of a lower temperature in the exposed part, and

European
Refined.
265

thick, and weighing 9 to 12 lb., is removed from each *dombolo* or flask.

The *raison d'être* of the process consists in preserving the temperature uniformly at the point of volatilization; the quicklime retains resin or empyreumatic oil, the iron fixes on any sulphur that may be present, while a little steam is often added to remove the last traces of impurity.

the refined
Cultiva
cannot be
introduce
Lucknow

tion
le to
f the
at a

Camphor
Plants.
266

tree there being cultivated has so far done well. It seems likely that, at a rate of 100 rupees worth of China Camphor annually, since there is every reason to believe that the tree could be raised in large quantities, the Camphor consumed in

CAMPHOR.

Chemical Formula for Camphor.

CAMPHOR OIL.

OIL.
267

Oil of Camphor.—There are two very distinct substances known by that name in commerce. The first and most important is the oleo-resin or camphor-oil of Borneo. This is obtained by tapping the trees. Sometimes this accumulates to such an extent that (as with the South American *copulba* tree) the trunk, no more able to resist the pressure of the fluid, spontaneously bursts open or has its tissue broken into large internal chambers, producing while this occurs a loud noise, "as if the tree were cut." The oil is obtained in cutting the trees, and is obtained in the time, being represented by the formula $C_{16}H_{16}$, but in its crude state it holds in solution a certain amount of Borneol and resin.

The other so-called Camphor-oil is quite distinct and should not be confused with the above. It is known as Camphor-oil of Formosa. This is a brown liquid, holding in solution an abundance of common camphor, and is found to drain from the cases containing crude camphor. It has an odour of sassafras. From this so-called oil, or rather solution, camphor is precipitated on the temperature of the liquid falling.

CHEMICAL AND MEDICAL PROPERTIES OF CAMPHOR.

268

Chemistry.—It is not necessary to enter into this subject in great detail. For a full account of the chemistry of Camphor the reader is referred to the *Pharmacopoeia*. These are more likely to be found in the papers in which this subject has been treated of from a purely chemical point of view.

1st.—ORDINARY CAMPHOR.—A white, translucent substance, of a crystalline structure, readily pulverised in the presence of a little alcohol or of ether. It possesses a smoky odour which is peculiar to it. It is a little oil.

This fact has been taken advantage of, in detecting the presence of oily substances in water. Camphor is only slightly soluble in water, but the amount may be increased by the addition of sugar. Carbonic acid also increases its solvent power. Ordinary alcohol will take 75 per cent. of camphor. When mixed with resins or concrete oils, camphor often partially or completely loses its odour. The formula given for this form of camphor is $C_{16}H_{16}O$; by treatment with various reagents it yields a number of interesting products. Prolonged boiling with nitric acid oxidises the camphor into *Camphoric acid*, $C_{10}H_{14}O_4$ and *Camphoronic acid*, $C_7H_{10}O_4$, water and carbonic acid being eliminated. When repeated into *Cymene* or *Cymol*,

1 $C_{10}H_{16}O$ It is somewhat does not consequently it. It is also heavier, without the aid of alcohol,

it is, in fact, a more compact and brittle substance than ordinary

Medicinal Properties of Camphor.

CAMPHOR.

camphor. It requires for fusion 198°C . In optical properties an alcoholic solution is found to be $12\frac{1}{2}^{\circ}$ dextrogyre. By the action of nitric acid it may be converted into ordinary camphor, and by continued oxidation, into *Camphoric acid*. Its medicinal properties are regarded as

CHEMISTRY.

more nearly related to

Medicine.—Camphor possesses stimulant, carminative, and aphrodisiac properties, and is widely used in medicine, both externally and internally. Its primary action is that of a diffusible stimulant and diaphoretic, its secondary, that of a sedative, anodyne, and antispasmodic. In large doses it is an acro narcotic poison. Camphor has been extensively used in the advanced stages of fevers and inflammation, insanity, asthma, angina pectoris, hooping-cough, and palpitations connected with hypertrophy of the heart, affections of the genito-urinary system, comprising dysmenorrhœa, nymphomania, spermatorrhœa, cancer, and irritable states of the uterus, chordee, incontinence of urine, hysteria, rheumatism, gangrene, and gout. It has also been employed as an antidote to strychnia, but

MEDICINE.
269

be discussed here at great detail. The reader is therefore referred to the *Pharmacopœia of India*, pp 190, 192, and other standard works on materia medica. As having a special bearing on India, however, the following extract may be republished from Waring's most useful little book, *Basar Medicines*—

"In chronic rheumatism, in addition to its use externally, it may be given internally in a dose of 5 grains with one grain of opium at bedtime, it affords relief by causing copious perspiration, which should be promoted by a draught of infusion of ginger and by additional bed-clothes. An excellent vapour-bath for these cases may be made by substituting half an ounce of camphor placed on a heated plate for the chertie of hot water. Thus employed, it causes speedy and copious perspiration. Care, however, is necessary to prevent the patient inhaling the vapour,

breathing are relieved by the same means. These pills also sometimes relieve violent palpitation of the heart. In the coughs of childhood, camphor liniment, previously warmed, well rubbed in over the chest at nights, often exercises a beneficial effect. For young children, the strength of the liniment should be reduced one-half or more by the addition of some bland oil.

"In rheumatic and nervous headaches, a very useful application is one ounce of camphor dissolved in a pint of vinegar, and then diluted with one or two parts of water. Cloths saturated with it should be kept constantly to the part.

"In spermatorrhœa, and in all involuntary seminal discharges, no

CAMPHOR

Medical Properties of Camphor.

MEDICINE

medicine is more generally useful than camphor in doses of 4 grains with half a grain of opium taken each night at bed time. In gonorrhœa, to relieve that painful symptom, chordee, the same prescription is generally very effectual, but it may be necessary to increase the quantity of opium to one grain, and it is advisable to apply the camphor liniment along the under surface of the penis as far as the anus. To relieve that distressing irritation of the generative organs which some women suffer from so severely, it will be found that 5 or 6 grains of camphor, taken in the form of pill twice or three times a day, according to the severity of the symptoms, will sometimes afford great relief. In each of these cases it is important to keep the bowels freely open.

"In painful affections of the uterus, camphor in 6 or 8-grain doses often affords much relief. The liniment should at the same time be well rubbed into the loins. In the convulsions attendant on child birth the following pills may be tried. Camphor and calomel, of each 5 grains. Beat into a mass with a little honey, and divide into two pills, to be followed an hour subsequently by a full dose of castor oil or other purgative.

"In the advanced stages of fever, small pox, and measles, when the patient is low, weak, and exhausted, and when there are at the same time delirium, muttering, and sleeplessness, 3 grains of camphor, with an equal quantity of asafoetida, may be given even every third hour, turpentine stupes or mustard poultices being applied at the same time to the feet or over the region of the heart. It should be discontinued if it causes headache or increased heat of the scalp. Its use requires much discrimination and caution.

"To prevent bed sores, it is advisable to make a strong solution of camphor in arrack or brandy, and with this night and morning to bathe, for a few minutes, the parts which, from continued pressure, are likely to become affected" (*Waring, Basar Medicines*).

The Lancet (May 31st, 1884) gives an account of a simple process of curing coryza by the inhalation of camphor vapour through a paper tube, the whole face and head being covered so as to secure the full action.

Special Opinions—§ "Daily employed in dispensary practice in the form of camphor-water as a vehicle for other medicines. When quinine is rejected by the stomach, the following formula may be used. Quinine gr. iii, camphor gr. ½, opium ½. To be made into a pill and given three or four times daily. A drachm of camphor dissolved in chloroform mixed with an ounce of simple ointment forms a soothing application for piles" (*Assistant Surgeon Farwant Rai, Multan*). "It is an irritant and rubefacient, good for a cold in the head with coryza, summer diarrhœa" (*Brigade Surgeon W. R. Rice, Jubbulpore*). "Largely used as a liniment for muscular pains. Is a good expectorant" (*Surgeon R. Gray, Lahore*). "Used in 3 or 4-grain doses and mixed with about ½ grain of extract of belladonna. I have found this to be of very great value in neuralgic pains" (*Assistant Surgeon Doyal Chunder Shome, Campbell Medical School, Calcutta*). "Sedative, expectorant, anodyne, antispasmodic, anaphrodisiac, and diaphoretic, doses 1 to 10 grains. I have used this in the following cases: (1) In acute bronchitis, with other ingredients. (2) In pneumonia, with amm carb and quinine. (3) In toothache and carious tooth, useful to relieve the pain if stuffed in the cavity. (4) In bilious headache, externally applied with vinegar and cold water. (5) In chronic rheumatism, either muscular or articular, if embrocated, mixed with mustard oil and opium. (6) In a few cases of cholera (cold stage) the use of the spirit of camphor with rum has proved successful. (7) In irritation and chordee of gonorrhœa, if given with belladonna in the form of pill" (*Hospital Assistant Abdulla, Civil Dispensary, Jubbulpore*). "Sedative and diaphoretic, useful in

Ilang-ilang.

CANANGA
odorata.

MEDICINE.

camphor is very effective in the passages. In the use, and think
 geon S. H. Browne, Hoshangabad, Central Provinces). "I have found
 that when given in 10-grain doses every fourth hour in cholera, good
 results follow. It is often administered with the fruit of the plantain to

epilepsy, puerperal convulsion, palpitation of the heart" (Hospital Assistant Chuna Lal, Fubulpore) "Is taken in large doses to procure abortion" (Surgeon Major D. R. Thompson, Madras) "Camphor is daily used as a stimulant, antispasmodic, sedative to the genito-urinary system, and parasiticide. The spirit of camphor is a useful remedy in cholera, in 1 to 5-drop doses" (Assistant Surgeon Nundo Lal Ghose, Bankipur). "Camphor. Used in 3 or 4-grain doses and mixed with about $\frac{1}{2}$ grain of extract of belladonna. I have found this to be of very

Journal of Agriculture,
 says that most seeds are greatly hastened in their germination by being
 soaked, previous to sowing, in soft water, to a pint of which a lump of
 camphor, the size of a finger, has been added. M. J. Leclercq

DOMESTIC
270

when placed in the soil

Canaphora glandulifera, Nees, see *Cinnamomum glanduliferum*, Meisner.
 LAURINEÆ

Canada Balsam, see *Abies balsamea*, Aiton ; CONIFERÆ.

CANANGA, Rumph ; Gen Pl, I, 24.

Cananga odorata, H. f & T. T, Fl Br. Ind., I, 56; ANONACEÆ

271

THE ILANG-ILANG of European perfumers.

Syn.—UVARIA ODORATA, Lamb

Vern.—Kadat ngan, Kadagngan, BURM, Ilang-ilang, MALA

References—Faxb, Fl Ind, Ed C B C, 454, Kurr, For Fl, Burm, I,
 33; Gamble, Man. Timb., 8; U S Dispens., 15th Ed., 1752; Spens
 Encyclop., 1422; Smith, Dic, Econ, Pl., 218

CANARIUM
commune.

Java Almond.

ILANG-
ILANGOIL.
272

Habitat.—A large evergreen tree of Burma (Ava and Tenasserim), distributed to Java and the Philippines. Cultivated in many parts of

Oil is said to be a solution of Ilang in coconut oil.
For further information see *Michelia*.

CANARIUM, *Linn.*; *Gen. Pl.*, I., 324.

273 *Canarium bengalense*, Roxb; *Fl. Br. Ind.*, I., 534; BURSERACEÆ

Vern.—*Gogul dhup*, NEPAL; *Narockpa*, LEPCHA; *Tekreng*, GARO; *Bisjang*, dhuna, ASS

References.—Roxb, *Fl. Ind.*, Ed C B C, 504; Kurz, *For. Fl. Burm.*, I., 200; Gamble, *Man. Timb.*, 68, xi; Voigt, *Hort. Sub. Cal.*, 149; O'Shaughnessy, *Beng. Dispens.*, 258; Royle, *Him. Bot.*, 177; Cooke, *Gums and Gum resins*, 7; Balfour, *Cyclop.*

Habitat.—A tall tree, with a straight cylindrical stem; it is met with in

GUM.
274

copal, which
leitta bazars

it sells at two to three rupees per maund

TIMBER
275

Structure of the Wood.—Shining, white, when fresh cut, turning grey on exposure, soft, even-grained, does not warp, but decays readily. Weight 28lb per cubic foot. It is much esteemed in Bengal for tea-boxes, and also for shingles. It is also valuable for building.

MEDICINE.
276

Medicine.—“The leaves and bark are used externally for rheumatic swellings.

FOOD

Food.—“Fruit edible

277

Structure of the Wood.—“Strong and durable, used for common house building” (*Trimen*).

TIMBER.

278

279

C. commune, *Linn.*; *Fl. Br. Ind.*, I., 531.

JAVA ALMOND TREE.

Vern.—*Jangali bédám*, HIND; *Jangali bédáné*, CUTCH, *Kagls mars*, *kagga libija*, *java badamiyanne*, KAN, *Canari*, MALA, *Rata-kakana*, SING

References.—Roxb, *Fl. Ind.*, Ed C B C, 504; Voigt, *Hort. Sub. Cal.*, 85; U S O'Shaughnessy, *Beng. Dispens.*, 258; Royle, *Him. Bot.*, 177; Cooke, *Gums and Gum resins*, 7; Balfour, *Cyclop.*, 7; Nat. Hist., *Fl.*

V., 298.

Habitat.—A plant introduced into Bengal.

GUM.
280

Gum.—The resin, it has long been supposed to be Elemi, but *Pharmacographia*, however, affirm that “The resin known in pharmacy as Elemi is derived from a tree growing in the Philippines, which

C. 280

Bengal Incense : Elemi.

CANARIUM
commune.

Blanco, a botanist of Manila, described in 1845 under the name *Ilexa Abilo*, but which is completely unknown to the botanists of Europe. Blanco's description is such that, if correct, the plant cannot be placed in either of the old genera *Ilex* or *Elaphium*, comprehended by Benthams and Hooker in that of *Bursera*, nor yet in the allied genus *Canarium*; in fact, even the order to which it belongs is somewhat doubtful."

"Manilla Elemi is a soft, resinous substance, of granular consistence not unlike old honey, and when recent and quite pure is colourless; more often it is found contaminated with carbonaceous matter which renders it grey or blackish, and it is besides mixed with chips and similar impurities. By exposure to the air it becomes harder and acquires a yellow tint. It has a strong and pleasant odour suggestive of fennel and lemon, yet withal somewhat terebinthinous. When moistened with spirit of wine, it disintegrates, and examined under the microscope is seen to consist partly of acicular crystals. At the heat of boiling water the hardened drug softens, and at a somewhat higher temperature fuses into a clear resin" (*Pharmacographia*, p. 147).

The *United States Dispensatory* (15th Ed.), page 536, says: "The Manilla Elemi is conjecturally referred to *Canarium commune*." In their *Medicinal Plants* Bentley and Trimen give a detailed description of this plant. They say: "It is also cultivated in Java, and has been grown in the gardens at Calcutta, where, however, it did not thrive. We cannot certainly identify it as the source of Elemi, but it is probably the 'Terebinthus Luzonis prima' of Camelli, in 'Ray's History of Plants,' which he says is called *Laguuan*, *Lantan*, and *Pagsaingan* by the natives, and *Arbol de la Brea* by the Spaniards." Elemi is said to be derived from the hypothetical plant *Ilexa Abilo* of Blanco, a botanist of Manila, who published a description of the tree from which the resin was obtained in 1845 under that name. Its description cannot be identified, but although, as stated above, it has been supposed to be allied to *Canarium*, there is no actual evidence of this, and it is doubtful if *Ilexa*, as described by Blanco, should be even referred to the *BURSERACEÆ*.

The gum is used principally in the manufacture of varnishes, also in felting and in medicine.

Oil.—The nut yields a semi-solid oil on expression, similar in appearance to coconut oil. It is used for culinary purposes, and is regarded palatable. It is also burnt in lamps.

§ "The bark yields an abundance of limpid oil with a pungent turpentine smell, congealing to a buttery camphoraceous mass. It is stated to possess the same properties as copaiiba (*O'Shughnessy*)" (*Surgeon C. F. H. Warden, Professor of Chemistry, Calcutta*).

Medicine.—Ainslie remarks that the gum has the same properties as Balsam of Copaiiva. It is applied in the form of an ointment to indolent ulcers. The oil expressed from the kernels might be substituted for almond oil. Dr. Waitz, in his *Diseases of Children in hot climates*, speaks favourably of the kernels in emulsion as a substitute for the European preparation, *Mistura Amygdala*.

Special Opinion.—§ "A demulcent" (*Surgeon W. Barren, Bhuj, Cutch, Bombay*).

Food.—Cultivated in the Moluccas for its fruit, which is a three-sided nut, when fresh, is mixed with the nuts in the Island of
ly, the nuts often produce diarrhoea (*Drury*).

Manilla Elemi.
281

OIL.
282

MEDICINE.
283

FOOD.
284

CANARIUM
strictum.

Black Dammar Tree.

285

Canarium strictum, Roxb, Fl Br. Ind., I., 534; Beddome, l. 128

THE BLACK DAMMAR TREE.

Vern.—Kāla dammar, HINDO, BENO, GUJ; Dhāp, gāgul, BOM, Dhāp rādhup, MAR, Karapu Kongliam, karapu dammar, congiliam-marum, karuppu dāmar, TAN, Nalla-rōjan, TEL.; Manda-dhup, rādhupada, KAN; Thelli, MALA.

References.—Roxb, Fl Ind, Ed. C.B.C., 501; Beddome, Fl Sylva, I, p. 128; Gamble, Man Timb., 68; Dols & Gibb, Bomb Fl. 52, Vaght, Hort Sub Cal., 149; Pharm Ind., 53; Moodeen Sheriff, Supp Pharm Ind., 85; Oymack, Mat Med, W Ind., 135, also 2nd Ed., 167, Bidie, List of Raw Prod., Paris Exp., 24, Drury, Us Pl., 104, Cooke, Gums and Gum resins, 93, Birdwood, Bomb Prod., 254, Lisboa, Us Pl. of Bomb., 40, Balfour, Cyclop., Smith's Dic., 150, Treasury of Botany.

Habitat.—A tall tree of South India. Common about Courtallum in the Tinnevely district and in Kanara.

GUM,
286

Gum.—It yields a brilliant resin called the Black Dammar of South India. This is obtained by making vertical cuts in the bark and setting fire to the bottom of the stem. This result is effected by lighting firewood piled to the height of a yard round the base of the trunk. The dammar exudes from the stem as high as the flames reached commencing about two years after the above operation. The flow is said to continue for ten years, between the months of April and November, and the resin is collected in January.

"This substance occurs in staccate masses of a bright shining colour when viewed *en masse*, but translucent and of a deep reddish-brown colour when held between the eye and the light, homogeneous, with a vitreous fracture, partially soluble in boiling alcohol, and completely so in oil of turpentine (Pharm Ind.)

BLACK
DAMMAR.
287

The following is Mr. Broughton's report on Black Dammar. "This well-known substance offers little chance of usefulness, in Europe at least, when the many resins are considered that are found in the market at a far less price. It is used in this country for many small purposes, as in the manufacture of bottling wax, varnishes, &c. Its colour when in solution is pale, if compared with its dark tint when in mass. Thus, though insoluble in spirit, its solution in turpentine forms a tolerable varnish. When submitted to destructive distillation, it yields about 78 per cent of oil, resembling that obtained from common colophony, but I fear, in the majority of its possible applications, it possesses few advantages over ordinary resin at 7s 6d per cwt. Major (now Col) Beddome estimates the price of Black Dammar on the coast of Kanara at Rs per 25lb (or nearly ten times the price of resin in England). The number of substances suitable for varnishes have lately become very numerous in Europe. Common resin is now purified by a patent process, consisting of distillation with superheated steam, by which it is obtained nearly as transparent and colourless as glass, in such amount that a single firm turns out 60 tons per week."

MEDICINE
Burgundy
Pitch
288

Medicine.—The resin is used medicinally, according to Dr. Bidie, as a substitute for Burgundy Pitch in making plasters.

Special Opinions.—§ "Bathing in a tub painted inside with dammar is supposed to relieve the irritation of prickly heat" (Surgeon Major A S G Fayakar, Muskat, Arabia). "Employed as a liniment with gingelly oil, in rheumatic pains" (Surgeon-Major F F L Ratton, Salem).

CANAVALIA
ensiformis

280

SWORD BEAN. Sometimes called **PATAGONIAN BEAN.**

$$V_{\text{max}} = 12.1 \pm 0.1 \text{ } \mu\text{mol } \text{H}_2\text{O} \text{ min}^{-1} \text{ mg}^{-1} \text{ protein}$$

p 144, fig 27.

11

CANES

White Cinnamon; Canes

294

Canavalia obtusifolia, DC, *Fl. Br Ind*, II, 196.References — *Thwaites, En*, Ceylon Fl, 89, *Voigt, Hort. Sub Cal*, 235; *Drury, Us Pl*, 105, *Balfour, Cyclop*; *New Cat*, 44

Habitat. — Met with on the coasts of the Western Peninsula, Ceylon, and the Malay Peninsula

"Is a useful binder of loose sand" (*Balfour*)

295

CANELLA, Sw; *Gen Pl*, I, 121, 970*Canella alba*, Murray, DC *Prod*, I, 563; CANELLACEÆ

WHITE CINNAMON, Eng. CANELLE BLANCHE, Fr, WEISSER ZIMMET, Germ. CANELLA BIANCA, It, CANELLA ALBA, Sp, CANELLA BLANCA, Sp

References — *Voigt, Hort Sub Cal*, 88, *Pharm Ind*, 25, *Fluck & Hanb*, *Pharmacog*, 73 *U S Dispens*, 15th Ed, 337, *Year Book of Pharmacy*, 1873, p 43, *Spons Encyclop*, 1419, *Smith, Dic*, 84, *Treasury of Botany*, *Hanbury, Sc Papers*, 353, *New Cat*, 14

Habitat — A West Indian aromatic plant, the bark of which is imported into India, and is sold by druggists, the tree might be cultivated in India

OIL

296

Oil — "An essential oil, erroneously called 'white cinnamon,' is obtained by the aqueous distillation of the bark, it is a mixture of caryophyllic (engenic) acid, an oil resembling cajuput, and an oxygenised oil" (*Spons, Encyclop*) It is a rare article, not known to commerceMEDICINE
Bark

297

Medicine — The bark is met with in rolls or quills two or three feet in length

The odour is something like an aromatic stimulant

other articles in constitutional debility, dyspepsia, scurvy, &c (*Pharm Ind*) In the West Indies it is used as a condiment and has some reputation as an antiscorbutic

CANES.

CANES
298

Canes.

CANNE, Fr, ROHR, Germ, Bhate, Hind, Nathur, Guz

The species of the genus *Calamus* — a genus of climbing palms — yields the canes of commerce Few plants are more useful to the hill tribes of India and the Malay than are the various forms of cane, yet very little of a definite nature is known as to the peculiar properties and uses of the individual species They afford "Dragon's blood" and the "Malacca" and "Rattan Canes" of commerce, but it is probable that each of these articles is obtained from more than one species of *Calamus* Reeds and small bamboos are sometimes, but incorrectly, spoken of as canesThe species of *Calamus* are formidable but graceful objects, giving a delicate green effect to the tropical vegetation Sometimes they occur as stunted erect bushes, by means of trees of the forest, to as much as 600 feet with spines and prickles The fruit hangs in great clusters, the innerCanes often
600 feet long.

C. 298

Asiatic Uses of Canes.

CANES.

large quantity of liquid, which may be collected by blowing through short

Substitutes
for Ropes.

299

Shafis.

300

importance.

THE ASIATIC USES OF CANES are varied and extensive. One of the most interesting, is the construction of these ropes, which may be seen from Silchar to Manipur, for example, three have to be crossed, namely,

Cane-bridges.

301

parallel canes forming the pathway, the canes being knit together with bamboo or bark, so as to constitute a band not more than 18 inches in breadth, through which the rushing water may be seen below. The railing affords additional support; it consists of two canes carried about three or four feet above the water, and there and the whole is supported by smaller canes.

Bridges.

bridge, for on raising the foot, the swaying structure and the rushing water

In the construction of these ropes, the object is to cut strong

Ropes.

and indeed throughout the Eastern Islands, vessels are furnished with cables formed of cane twisted or platted. This sort of cable was formerly extensively manufactured at Malacca" (*Royle, Fibrous Plants*). Dampier says: "Here we made two new cables of rattan, each of them four inches about. Our captain bought the rattans, and hired a Chinese to work them, who was very expert in making such wooden cables. These cables

of the after which they were used to pull them down; nor can we carry them out but by placing two or three boats at some distance asunder, to buoy up the cable, while the long-boat rows

CANES

European Uses of Canes

out the anchor" Ropes are regularly made in China by splitting the rattan and twisting the long fibres thus prepared into a rope of any desired thickness This is rarely if ever done in India, entire canes being always used The smaller canes are extensively employed in basket-work, both entire and cut Useful chairs, sofas and couches are made all over India from cane, and cane *punkha* ropes are almost in universal use In Bengal baskets (*dhama*) are made of entire canes by twisting the canes round and round and fastening the one to the other by thin strips. The practice of cutting the cane into narrow strips for caning chairs may be regarded as a European industry, but it is now practised all over India the chairs made in this way being light and cool A strong and durable floor mat for office purposes is constructed of small entire rattans, bound together, by means of cane-strings, the canes being arranged so as to be flat and parallel

THE EUROPEAN USES OF CANES are even more varied than the Asiatic They are valued on account of their lightness flexibility, and strength They are extensively used as walking sticks, umbrella handles, and even as a substitute for whalebone for umbrella and parasol ribs, each set of such ribs costing only from 1d to 2½d instead of 2s 6d to 3s for whalebone. Cane is also extensively employed in saddlery and harness, and a wicker-work of rattan is now used in the construction of the German military helmet, which is said to make it sword proof But the chief purpose to which cane is put in Europe is in furniture and basket making In India, canes are cut up by hand the outer strips being separated at the expense of the central core In Europe this central portion is saved, a patented machine being used to split the rattans which cuts off the outer layer in bands of any required size or thickness while leaving the central core in the form of a perfectly round and even rod This rod is utilised in the construction of fancy baskets, chairs and window blinds and has one property not possessed by the strong outer bands namely that it takes with ease any desired colour European authorities do not appear to be aware, however, of the fact that the Nagas and other hill tribes of Assam dye human and goats hair a beautiful scarlet, as also tint with the same colour the outer silicious layer of the rattan cane Bands of stained rattan they use for decorating ear rings bracelets, and leggings

Prepared strips of rattan are extensively used in Europe as in India for caning furniture, but a comparatively new and increasing trade in rattan is the construction of baskets, which are rapidly displacing willow baskets, these are used in cotton mills, sugar refineries, and other factories, as well as employed extensively by Railway Companies and by gardeners, &c Rattan baskets are peculiarly adapted for carrying carboys containing acids, since the silica of the cane is not acted on by acids (*Spons, Encyclop*) The waste product, after stripping the cane, is by certain manufactures reduced to a fibre, and in this form is largely used for stuffing mattresses Cane mattresses are in great favour on the Continent, taking the place of the cuir of India

TRADE RETURNS OF CANES

Very little can be learned regarding the internal trade in rattan canes; but, from the fact of the imports (which come chiefly from the Straits Settlements) into Calcutta, Madras, Burma, and Bombay, far exceeding the exports, it seems that with improved facilities of communication a trade might easily be opened up with Eastern Bengal, Assam, and Burma which would to a large extent check the importation, from foreign countries, of a product of which India has herself an unlimited amount The following

Trade Returns.

CANES

summary of the foreign trade in "Canes and Rattans" will be found instructive:—

TRADE

Foreign Trade in Canes and Rattans

YEAR.	IMPORTS.		EXPORTS AND RE-EXPORTS	
	Quantity	Value.	Quantity	Value
	Cwt	R	Cwt	R
1879-80	20,617	1,93,035	7,483	73,582
1880-81	21,164	1,99,557	16,346	1,62,363
1881-82	29,559	2,92,754	23,801	2,06,544
1882-83	24,603	2,46,476	14,244	1,33,061
1883-84	28,183	2,51,203	20,836	1,54,884
1884-85	33,408	3,10,675	14,133	1,33,734
1885-86	21,213	1,77,536	6,485	56,844

Detail of Imports, 1885-86.

Province into which imported	Quantity.	Value	Country whence imported	Quantity.	Value
	Cwt	R		Cwt	R
Bengal	7,194	66,198	Siam	413	3,158
Bombay and Sind	9,871	79,095	Straits Settlements	20,350	1,72,840
Madras	1,162	8,713	Other Countries	450	1,498
British Burma	2,986	23,530			
TOTAL	21,213	1,77,536	TOTAL	21,213	1,77,536

Detail of Exports, 1885-86

Province from which exported	Quantity.	Value	Country to which exported	Quantity	Value
	Cwt	h		Cwt	h
Bengal	1,525	20,770	United Kingdom	3,827	35,030
Bombay	623	7,406	United States	427	8,435
Madras	637	1,254	Italy	63	1,160
British Burma	3,700	32,354	Cape Colony	469	6,128
			Mauritius	187	1,080
			Other Countries	1,512	5,011
TOTAL	20,836	1,34,884	TOTAL	6,485	56,844

The reader is referred for further particulars to the information given under the species of Calamus. In concluding this account of Canes, it is necessary to briefly mention a few of the more common articles sometimes sold, though incorrectly, under the name of cane. The most important is the "male ba" coming very returns for " of grasses are also now used for this purpose; the Whangee cane of China

Substitutes
for canes
317
Whangee
canes.
318

CANNA indica.	Indian Shot.
Palm walking sticks. 319 Male bamboo 320	is one of the greatest favourites of this class. These are the beautifully jointed stems, with a portion of the root, of <i>Phyllostachys nigra</i> . Specially prepared palm walking-sticks may also be included under the heading of canes. These are chiefly prepared from the betel-nut palm, the palmyra palm, and from the cocoa-nut palm, and are now-a-days largely used for umbrella handles. The "Malacca cane" is obtained from <i>Calamus Scipionum</i> , and the rattan from <i>C. Ratong</i> and one or two allied species, the former obtains its beautiful colour by being smoked.
321	CANNA, Linn., <i>Gen. Pl.</i> , III, 654
	Canna indica, Linn.; Roxb., <i>Fl. Ind.</i> , Ed. C.B.C., 1; SCITAMINEÆ.
	INDIAN SHOT
	Veru — Canna — H. — — — — — N W D C. — — — — —
	Butsarana, SING
	References — <i>Thwaites</i> , <i>En. Ceylon Pl.</i> , 320, <i>Dals & Gibs</i> , <i>Bomb Fl. Suppl.</i> , 88, <i>Voigt</i> , <i>Hort. Sub. Cal.</i> , 576, <i>Fluck & Hanb.</i> , <i>Pharmacog.</i> , 634, <i>U. C. Dutt</i> , <i>Mat. Med. Hind.</i> , 317, <i>Drury</i> , <i>Us. Pl.</i> , 105, <i>Baden Powell</i> , <i>Pb. Prod.</i> , 332, <i>Atkinson</i> , <i>Him. Dist.</i> , 730, <i>Balfour</i> , <i>Cyclop.</i> , <i>Smith</i> , <i>Dic.</i> , 220, <i>Treasury of Botany</i> , <i>Morton</i> , <i>Cyclop.</i> , <i>Agri.</i>
	Habitat. — Several varieties are common all over India and Ceylon, chiefly in gardens, where they are grown as ornamental and flowering plants, they are in flower all the year.
DYE. Seed. 322	Dye — "The SEED is black, and round like a pea and yields a beautiful but evanescent purple dye" (<i>Dals & Gibs</i> , <i>Bomb Fl.</i>)
MEDICINE. Root. 323	Medicine — The ROOT is used as a diaphoretic and diuretic in fevers and dropsy (<i>Atkinson</i>), and also given as a demulcent (<i>Irvine</i>). It is considered acrid and stimulant (<i>Fleming</i>). When cattle have eaten any poisonous grass, which is generally discovered by the swelling of the abdomen, the natives administer to them the root of this plant, which they break up in small pieces, boil in rice-water with pepper, and give the cattle to drink (<i>Drury</i>). The SEED is cordial and vulnerary (<i>Baden Powell</i>).
Seed. 324	Food. — <i>Drury</i> says "Nearly all the species contain starch in the root-stock, which renders them fit to be used as food after being cooked. From
FOOD Root. 325	
Starch. 326	
Allment or arrow-root. 327	§ "In the West Indies arrow-root has been obtained from <i>C. glauca</i> , called 'Tous les mois' (O'Shaughnessy)" (<i>Surgeon C. F. H. Warden</i> , <i>Professor of Chemistry, Calcutta</i>)
DOMESTIC. Leaves. 328 Seeds. 329 Necklaces. 330	Domestic Uses — used for wrapping up resembling shot, for necklaces and other are used to thatch houses" (<i>Drury</i>). [See also under Beads, Vol. I — Ea] "In Bangalore, the leaves are used by the natives in lieu of plates, to serve rags pudding and other dishes" (<i>J. Cameron, Esq.</i>)

Indian Hemp.

CANNABIS
sativa.

CANNABIS, Linn. ; Gen. Pl, III, 357.

331

Cannabis sativa, Linn. ; DC. Prodr., XVI., I., 30 ; URTICACEÆ.

HEMP ; INDIAN HEMP ; CHANVRE, Fr. ; HANF, Germ. ; CANAPE,
Il. ; KONAPLI, Rus. ; CANAMO, Sp ; HAMP, Dan. ; KANAS,
Keltic ; CANNABIS, Latin and Greek.

Syn—C. INDICA, Lamk.

V.—

पत्ता, चापोला, अनुन्दा, कुरसिनी, सान्स ; Kandi, KASHGAR, Kinnab,
Kinnab, nabatul-gunnab, kanab, ARAB ; Darakhe-kinnab, darakhe-bang,
bang, nabatul-gunnab, PERS ; Bhénbin, ben, bin, séjav-bin, sechaub,
BURM ; Mathansha, ganya gahd, kansá-gahd, SING.

be cultivated under the name Zannu

References—DC Prodr., XVI., p. 1, 30, published in 1869, Roxb., Fl.
Ind., Ed. C B C, 718, Kurz., For Fl., Burm., II., 420, Dals & Gibs,
Bomb. Fl., Suppl., 79, Stewart, Ph. Pl., 215, Aitchison, Cat., Ph. and

Habitat.—Cannabis indica has been reduced to C. sativa—the Indian
plant being viewed as but an Asiatic condition of that species. This
extends the region of the hemp-plant very considerably. It has been found

CANNABIS
sativa

The History of the Indian Hemp

Hemp
Acclimatised
and
Cultivated
in
India

wild to the south of the Caspian Sea, in Siberia, in the desert of Kirghiz. It is also referred to as wild in Central and Southern Russia and to the south of the Caucasus. The plant has been known since the sixth century B.C. in China, and is possibly indigenous on the lower mountain tracts. Bosser mentions it as almost wild in Persia, and it appears to be quite wild on the Western Himalaya and Kashmir, and it is acclimatised on the plains of India generally. Indeed, the intimate relation of its various Asiatic names to the Sanskrit *bhang* would seem to fix the ancestral home of the plant somewhere in Central Asia. On the other hand the Latin and Greek *Cannabis* is apparently derived from the Arabic *Annab*. De Candolle says that "the species has been found wild, beyond a doubt, to the south of the Caspian Sea, in Siberia, near the 'Irtysh,' in the desert of the Kirghiz, beyond Lake Baikal, and in Dahuria." He is doubtful of its being a native of Southern and Central Russia, but suspects that its area may have extended into China, and is not sure about the plant being indigenous to Persia.

It has gone wild as a cold season annual on rubbish heaps in Bengal and in many other parts of the plains of India. It is specially reported as springing up spontaneously on the *churs* of the Subarnarekha river and to be wild in the territory of the Mohurbhunge State on the frontier of Midnapur and also in Singbhum. It is cultivated more or less throughout India either on account of the narcotic derived from (a) the resin, *charas*, (b) the young tops and unfertilised female flowers—*ganja* (or *ganja*), (c) the older leaves and fruit-vessels—*blang*, or on account of the fibre, *HEMP*, or the ripe seed from which an oil is prepared. *Ganja* is derived from the cultivated plant, reared in Eastern Bengal, the Central Provinces, and Bombay, *Charas*, from the cultivated plant on the mountain tracts, such as in Nepal, Kashmir, Ladakh, Afghanistan, *Blang* from the wild plant on the lower hills, especially in the North-West Provinces, the Panjab, and Madras. In Europe especially in Central and Southern Europe, the plant is cultivated on account of the fibre and the seeds are eaten or made into oil. For some time the European form of the plant was supposed to be distinct from the Asiatic, the chief value of the latter consisting in its narcotic properties, but this distinction has now disappeared from the literature of the subject since it could not be supported by botanical characters. The reduction became the more necessary when it was fully understood that, according to climate and soil, the Indian plant varied in as marked a degree as it differed from the European. On the mountains of upper India for example, it yields a good fibre which the natives separate and weave into garments or twist into ropes, but its chief value in Kashmir and Ladakh consists in the fact that just before maturing its flowers, the bark spontaneously ruptures and a resinous substance exudes. This is also found upon the young leaves, flowers and fruits, and when rubbed off constitutes the narcotic *charas*. The same plant cultivated in the plains is found not to secrete its resin in this way but instead it charges the young female flowers and twigs with the narcotic principle, this constitutes the *ganja*. It has been observed that if even one or two male plants are left in a field, the whole crop of *ganja* will be destroyed since, with the fertilisation of the flowers the *ganja* almost entirely disappears. In other parts of India the narcotic property is not developed until the fruits are mature, leaves at this stage, and sometimes the fruits also afford *blang*. With *Cannabis indica* differing in so marked a degree according to the climate, soil, and mode of cultivation it was rightly concluded that its separation from the hemp plant of Europe could not be maintained. We have here, in fact, one of the most notable illustrations of the effect of climate in changing the

The History of the Indian Hemp.

CANNABIS
sativa.FORMS OF
HEMP.

chemical processes which take place in the structure and physiological peculiarities of a plant. In most instances, a plant taken by man from one climatic condition to another, either dies quickly, or if it survives, it exists in a sickly condition. A few plants however, such as the potato, the tobacco, the poppy, and the hemp, seem to have the power of growing with equal luxuriance under almost any climatic condition, changing or modifying circumstances. . . . of this; he . . . or no tendency to produce the narcotic principle which in Asia constitutes its chief value.

The plant for one or other of these purposes is now extensively cultivated throughout Persia; in India, from the level of the sea in Bengal to the inner Himalaya at an altitude of 10,000 feet; in China; in Arabia; and in Africa, from the extreme south to the north, and on the mountains as well as on the plains; in the north-eastern portions of America and on the table-land of Brazil. It is also to be met with in Northern Russia even as far as Archangel. In England it not unfrequently occurs as a weed, springing up most probably from rejected birdseed.

The modes of cultivation and the nature of the soil required, depend on the purpose for which the plant is cultivated. This subject will accordingly be discussed later on.

HISTORY OF HEMP.

THE NARCOTIC.

Indian Literature.—“The earliest synonym appears to be *blānga*, which occurs in the Atharva Veda—the last of the four scriptures of the Hindūs. It is derived from a root which means ‘to break,’ and is supposed to imply the process of debarkation by which the fibres of the plant were separated from the stem. This would indicate that even at the remote period when the *Veda* in question was written, probably about 3,000 years ago, the use of hemp as a fibre-yielding plant was well known and the knowledge fully utilised. The *Veda*, however, reckons it, along with the *Soma*, as one of the five plants ‘which were liberators of sin,’ and this would imply that its narcotic property was also well known. The word is used in the masculine form with a short final vowel, and not, as in later literature, with a long one. Both the masculine and feminine

for some other diseases. In the Institutes of Manu the feminine form is used, and the plant is noticed for its fibres. In later works the feminine form prevails” (*Mr Hem Chunder Kerr*). The curious fact of the popular

probability, the habit of speaking of the narcotic in the masculine form of the name, and of the fibre in the feminine. As a matter of fact, the nar-

CANNABIS
sativa.

The History of the Indian Hemp.

HISTORY.

cotic-yielding is the reverse to the popular belief: the male or staminate

this distinction would seem to point to the idea that the ancient Chinese and Sanskrit writers were aware of the existence of male and female flowers centuries before the sexes of plants were realised in Europe.

The intoxicating property of the drug is implied in the names *ānandā*, "the joyous," *harṣinī*, "the delight-giver," *madanī*, "the intoxicator," and *gānjā* and *gānjakīnī*, "the noisy." The probable importation of the narcotic in ancient times into India in a prepared form, as it comes at the present day from Yarkand, is indicated in the name *Kāshmirī* often applied to it in early literature. It is thus probable that the knowledge of the narcotic, or at least of *charas*, was brought to India across the *Himālaya*.

The
Narcotic.
333

Classical Literature of Europe.—The ancient *SCYTHIANS* seem to have been acquainted with the narcotic properties of the plant as well as with its fibre. *HERODOTUS* tells us that they excited themselves by "inhaling its vapour." "*HOMER* makes *HELYS* administer to *TELEMACHUS*, in the house of *MINELAUS*, a potion prepared from *nepenthes*, which made him forget his sorrows. This plant had been given to her by a woman of Egyptian Thebes, and *DIONORUS SICULUS* states that the Egyptians laid much stress on this circumstance, arguing that *HOMER* must have lived among them, since the women of Thebes were actually noted for possessing a secret by which they could dissipate anger or melancholy. This secret is supposed to have been a knowledge of the qualities of hemp" (*Johnston, Chemistry of Common Life*, 337).

Mythology.
334

Mythological History of the Narcotic—"The notices of hemp in Arabic and Persian works are much more numerous. The oldest work in which it is noticed is a treatise by *Hassan*, who states that in the year 658 A H, *Sheik Jafer Shirazi*, a monk of the order of *HAIDER*, learned from his master the history of the discovery of hemp. *Haider* lived in rigid privation on a mountain between *Nishabar* and *Rama*, where he established a monastery. After having lived ten years in this retreat, he one day returned f
on being
had gai
spot, wh
in wine
Halder

A curious story is told in the *Hindū* mythology about the origin of this plant "It is said to have been produced in the shape of nectar

The History of the Hemp Fibre.

CANNABIS
sativa.

HISTORY.

More Recent Historic Facts regarding the Narcotic.—The use of hemp (*bhang*) in India was particularly noticed by Garcia de Orta (1563), and the plant was subsequently figured by Rheede, who described the drug as largely used on the Malabar coast. It would seem about this time to have been imported into Europe, at least occasionally, for Berlu, in his *Tr. de Bot. des Indes*, describes it as coming from Persia and East

callin,

DeLacy (1809) and Rouger (1810). But the introduction of the Indian drug into European medicine is of still more recent date, and is chiefly due to the experiments made in Calcutta by O'Shaughnessy in 1838-39. Although the astonishing effects produced in India by the administration of preparations of hemp are seldom witnessed in the cooler climate of Britain, the powers of the drug are sufficiently manifest to give it an established place in the Pharmacopœia" (*Flück. & Hanb. Pharmacog.*, 547-48).

HISTORY OF THE HEMP FIBRE.

The Fibre.

335

The following extract may be considered as the most trustworthy facts which can be gathered of the fibre: "According to Herodotus, but in his time the Greeks were scarcely acquainted with it. Hiero II., King of Syracuse, bought the hemp used for the cordage of his vessels in Gaul, and Lucillus is the earliest Roman writer who speaks of the plant (100 B.C.). Hebrew books do not mention hemp. It was not used in the fabrics which enveloped the mummies of ancient Egypt. Even at the end of the eighteenth century it was not used in the fabrics of the

Russia when they migrated westward about 1500 B.C., a little before the Trojan War. It may have been earlier known to the Aryans into the dwellings of Switzerland

The Arabic name *kannab* or *konnab*, admittedly the origin of the Greek *Kannabis* and of the Latin *Cannabis*, and from this again the English word came. So in like manner, the Arab word *hasish* has given rise to the

Canvas.

Assassination.

with *hasish* before performing certain ceremonies or perpetrating inhuman deeds. The word according to some would appear to have been originally used in Syria to designate the followers of "the old man of the mountains;" by others it came into European use during the wars of the Crusaders. Certain of the Saracen army, having intoxicated themselves with the *hasish*, rushed fearless of death into the Christian camp, committing

CANNABIS
sativa.

History of the Hemp Narcotic.

great havoc. It seems probable that the English form of the word was adopted at the latter date, but that the more Arabic form was known in Europe for some time previous. Hemp is alluded to in the "Arabian Nights" under its more ancient Arabic name, *beng*.

CULTIVATION

It has already been incidentally remarked that the cultivation of *Cannabis sativa* in India is naturally referable to two sections (a) Cultivation with a view to preparing some of the forms of the narcotic, and (b) cultivation on account of the fibre. It has also been stated that the hemp plant has, to a large extent, changed its character under Indian or rather Asiatic cultivation. It is very generally admitted, for example, that in the plains, while the narcotic principle is readily developed, the hemp fibre is but very imperfectly formed. Let it, however, be distinctly understood that by hemp is here exclusively meant the fibre of *Cannabis sativa*. This remark is all the more necessary when it is added that in the Government returns of the Trade and Navigation of British India, the fibre of *Cannabis sativa*, as well as that of *Crotalaria juncea*, *Musa textilis*, and perhaps the fibres also of one or two other plants, are commercially returned as hemp, and the manufactures therefrom as hemp manufactures. To obtain the true hemp fibre, a rich soil and a high state of cultivation is required in a temperate climate. The plant will grow anywhere in India, and may be said to be naturalised in every province. This fact seems to have influenced the minds of the earlier writers on this subject, who uniformly urge that since it grows so freely in a wild state, it might be cultivated to any desired extent as a source of fibre. Dr. Stocks (one of the most careful observers India has ever had) wrote in 1848—"The plant grows well in Sind, and if it ever should be found advantageous (politically or financially) to grow hemp for its fibre, then Sind would be a very proper climate." The writer does not think that the question of its possible cultivation as a cold-season fibre-crop on the plains of India has been fully tested. There may be some localities where this might be found possible* and even remunerative, but so far as the published experiments go, like flax the hemp plant may be grown freely enough, but not as a source of fibre. The flax plant of the plains of India yields a superior oil-seed, and the hemp plant a valued narcotic, but neither would seem to justify the expectation of becoming a profitable fibre crop. This fact does not appear to have been fully realised by writers in Europe, and on the one hand the existing cultivation of hemp as a source of narcotic has been confused with a supposed fibre production, while on the other, the reports of the limited Himalayan cultivation as a source of fibre have been mistaken as the total Indian cultivation of the plant. The authors of the *Pharmacographia* say "It is found in Kashmir and in the Himalaya, growing 10 to 12 feet high and thriving vigorously at an elevation of 6,000 to 10,000 feet." Balfour, in his new edition of the *Cyclopædia of India*, while stating incidentally that the "plant is grown in Persia, Syria, Arabia and throughout India," enters into an account of its cultivation in Garhwâl, with the apparent object of proving that it is more extensively grown there than in the Panjab, but he makes no mention of the fact that the principal seats of hemp cultivation, as a commercial article, are in Eastern Bengal, the Central Provinces, and Bombay. The *Encyclopædia Britannica* has also fallen into the same mistake, and, indeed, illustrations might be multiplied to show that undue prominence has been given to the fact that the plant is grown in Garhwâl, the

CULTIVA-
TION.
336Expectations
regarding
Hemp Fibre.

* See a further page regard ag Godavery District

The Cultivation of Hemp in India.

CANNABIS
sativa.CULTIVA
TION

Panjab, and Kashmir, the more so since by most writers the true regions of Indian cultivation have been, to a large extent, overlooked.

Unfortunately, the available material is too meagre to allow of the subject being dealt with province by province, although there are doubtless different methods pursued in each. This difficulty, fortunately, does not exist with the Lower Provinces, since Mr Hem Chunder Kerr in his *Report on the Cultivation of and Trade in Gánja in Bengal (1877)*, has placed in the hands of the public a valuable treatise which deals both with the cultivation of the plant and the preparation of the narcotic. Dr Forbes Doyle, in 1885, issued his *Flora of India*, a work which fully the cultivation pur-

Messrs Duthie and Fuller's *Field and Garden Crops*, gives a brief account of the cultivation in the North-West Provinces. From these works, and the writer's own personal observations, supplemented by several less important publications, and Government reports, the following abstract regarding Indian hemp cultivation has been prepared.

(a) CULTIVATION FOR THE NARCOTIC

For the
Narcotic.
337

Bengal Cultivation—The method pursued in Eastern Bengal, according to Mr Hem Chunder Kerr, is briefly as follows. After selecting the land, for hemp cultivation, the preparation of the soil commences in March-April, but where this can be afforded operations are started even earlier. The sites selected are those which are moist but not shaded, and the soil a rich friable loam. The land is then ploughed from four to ten times, the object being to free it as far as possible of all weeds. Fresh earth from the surrounding ditches or from any neighbouring low-lying land is thrown over the field and it is freely manured with cowdung. After a week this is ploughed into the soil, and the ploughing repeated as often as the means of the cultivator will admit of. The belief is that for hemp the field is of the After thrown

into ridges a foot high, the furrows being a foot in breadth.

NURSERY—It is customary for the cultivators to combine in the rear

used. On a sunny day the seed is sown broadcast and by the latter end of September, the seedlings are about 6 to 12 inches high, and are then ready for transplantation. About 4 to 5 seers of seed are deemed necessary for every *bigha* of land to be cultivated with hemp.

TRANSPLANTATION—The seedlings are planted out 6 to 8 inches apart

thrown up around the plants.

TREATMENT OF THE PLANTS—Trimming of the plants commences by November. This consists in lopping off the lower branches so as to favour the upward growth of the shoots. The ridges are again re-dressed and manured, the furrows ploughed, and all weeds removed. At this stage the plants begin to form the flowers, when the services of an expert, known

CANNABIS
sativa

The Cultivation of Hemp in India

CULTIVA-
TIONFruits
injure
Ganja

as the *ganja* doctor (*hoddar* or *parakddar*) are called in. This person passes through the field, furrow by furrow, cutting down all the male or staminate plants, or what are colloquially known as *madi* (female) plants. Speaking of the importance of this operation Mr Hem Chunder Kerr remarks "The presence of a few *madi* plants in the field suffices to injure the entire crop, inasmuch as all the plants run into seed and the *ganja* yielded by them is very inferior and scarcely saleable." The destruction of the *madi* plants is, however, never so complete but that a few escape detection, the result being that a certain number of the female plants are fecundated, fruits and seeds being produced. These are thrashed out as far as possible in the manufacture of the drug, the quality of which may be judged of by the freedom from such impurities.

The female plants come to maturity about the beginning of January, but the *ganja* is not fully developed till a month later. The crop is sold in the field to the *ganja* dealers, who bring their own men to manufacture it. The crop intended to be made into what is technically known as flat *ganja* is reaped a few days before that intended for the round form.

In another page will be found an account of the processes of manufacture of the various forms of *ganja*, together with considerable details as to the extent of cultivation as a source of the various forms of the narcotic.

For the Fibre
338

(b) CULTIVATION FOR THE FIBRE HEMP

Indian Methods.—Dr Royle very appropriately remarks "There is every reason for believing that the plant is of Eastern origin, while there is no sufficient reason for thinking that the climate of Europe is so peculiarly suited to the production of its fibre as to exclude those of its native climes, especially where attention is paid to those where the plant is grown on account of its fibre, and those distinguished from the others where it is cultivated for its resinous and intoxicating secretion. The latter requires exposure to light and air. These are obtained by thin sowing, while the growth of the fibre is promoted by shade and moisture, which are procured by thick sowing." It has already been pointed out that the regions suited for *ganja* cultivation are perfectly distinct from those where it might be possible to develop an industry in the fibre. However much it may be regretted it seems impossible to combine the two industries, and it is an accepted fact that unless utilisable as a paper stock, the immense amount of stems annually destroyed by the *ganja* cultivators must continue to be so.

Godavery
Hemp
339

At the same time Mr Morris in his account of the Godavery District gives some interesting facts regarding the cultivation of hemp fibre. It is planted in November and cut by the end of March. It is grown in drills and never watered. Clay soils and those beyond the reach of inundation are those best suited. "About 2,200 bundles can be produced in one *putti* of land, each bundle yielding 1½ *maunds* of fibre, or a total of 3,300 *maunds* or 412½ *maunds* and is valued at one rupee a *maund*. The expenses of cultivation are estimated at Rs-8 and those of the preparation of fibre at Rs-100 a *putti* of land. The bundles are buried in mud and left to rot for about a week when they are taken out and beaten in the water, and after all impurities are removed the fibre is collected." The exports from the district are said to have been, in 1854-55, 4 269 cwt.

Unless there be some mistake, *Sunn* hemp having been called "*Cannabis sativa*," for Mr Morris gives that scientific name as well as the vernacular name *zanzum* for the fibre he is describing the information is of the greatest interest, as it would show, what the writer was not aware of until recently, that hemp fibre was actually produced on the plains of India.

Cultivation of Hemp in India.

CANNABIS
sativa.

EARLY EXPERIMENTS IN HEMP CULTIVATION.—In 1802 the Government of India made various experiments on an extended scale to establish hemp fibre cultivation. European seed was imported, and farms and factories established, but finally abandoned. Recourse was had to improving the cultivation of the Indian stock. The cultivation and manufacture was carried on at Mhow, Rohilkhand, and Azimgarh. European hemp-dressers were employed, but the experiments abandoned.

CULTIVA-
TION
For the Fibre.

the rejected stems from
but the enquiry in this

RESULTS—In spite of these disheartening results, it cannot be definitely stated that it is impossible that hemp fibre can be produced in India. The efforts alluded to were mainly directed to combining the two industries of producing resin and fibre, and

Possible
Prospects

Kumaon and Garhwal grow the plant on account of its fibre, and with the results of the experiments conducted at the beginning of the century before him, Dr. Royle still entertained the highest hopes of ultimate success. From a paper which appeared in 1839, in the *Transactions of the Agr. Hort. Society of India, Vol. VIII. p. 15*, the following passage may be reprinted, as it expresses pretty clearly Dr. Royle's view:—"This (hemp) might be cultivated in suitable situations in India, in a manner similar to that adopted in Europe, or like that practised with its substitutes in India. The effect would undoubtedly be to produce a sufficiently long fibre, which would also be softer and more pliable at the same time that it retained a

extensive in India
20 shillings per c
hemp are selling

Dr. Royle alludes to successful experiments of hemp cultivation in the plains, especially at Chittagong. But in most cases, as was proved with the plant reared at Saharanpur, it is admitted that the plains crop is far inferior to that reared on the hills. The opinion is therefore arrived at that

dicial to its growth, and it seems to thrive best at from 4,000 to 7,000 feet in altitude above the sea. After being well prepared and freed from weeds, the ground is sown in May or June. During the growth of the

CANNABIS
sativa.

The Cultivation of Hemp in India.

CULTIVA-
TION.
For the
Fibre

plants the ground is once or twice dressed, and, where necessary, the plants thinned so as to leave a few inches between each. The plants ultimately attain a height of 12—14 feet, and from September to November the crop is

is
to
the
tak

for Rs. 357." It is commonly reported that the cultivation of the hemp-narcotics is prohibited in the North-West Provinces. In an early paragraph (No. 339), it has been shown that hemp fibre would appear to be cultivated in the Godavery District.

SEASON OF SOWING AND REAPING.—Messrs. Duthie and Fuller remark:—"The seed is sown in May at the rate of 30 seers to the acre, and the plants are thinned out if they come up too closely, and are kept carefully weeded. By September they will have attained a height of 12 or 14 feet. In the hemp the male and female organs are contained in separate flowers and plants (called *phul-bhang*) yield before the female their seed ripens. The plants (called *charas*), which is done by rubbing the seed pods and leaves between the hands."

European Cultivation for the Fibre.—Dr. Royle and several other authors give accounts of the methods pursued in Europe in hemp culti-

almost any where in the temperate and sub-tropic regions of the globe, it can be made to appearance, yields poor fibre for the first crop or two, but Himalaya seed is inferior to none." Constant change of seed is recommended and good seed is described as plump and of a bright-gray colour.

"The fibre afforded by the male plants is tougher and better than that yielded by the females; it is usual to divide the harvest. The males are gathered as soon as they have shed their pollen, about 13 weeks after sowing; each is uprooted singly, care being taken not to injure the stem."

"The fibre is separated either by retting or by breaking and scutching" (*Spons' Encycl.*).

Properties and Uses of Cannabis sativa

From the STEMS, LEAVES, or FLOWERS, and even the FRUITS, a RESIN-
OUS EXTRACT, of a powerful narcotic character, may be prepared. The
INNER BARK affords the valuable FIBRE HEMP. The SEEDS are occa-

C. 341

Italian Hemp
340Male Fibre
341ECONOMIC
PROPERTIES

The Narcotic—Indian Hemp.

CANNABIS
sativa.

sionally eaten; they are much valued for feeding birds. An OIL is expressed from them which is of some importance, but can scarcely be called commercial.

RESIN OR NARCOTIC.

There are primarily three forms of this substance, but under each there exist also local modifications, special preparations from these, and adulterants or imitations. The three forms are known as *Ganjā*, *Charas*, and *Bháng*. *Ganjā* is the female flowering tops with the resinous exudation on these: *Charas* the resinous substance found on the leaves, young twigs, bark of the stem, and even on the young fruits: *Bháng*, the mature leaves and in some parts of India the fruits also, but not the twigs.

BENGAL MANUFACTURE.

(1st) *GĀNJĀ*.—This is known in the trade as consisting mainly of two forms: *Flat Gānjā* and *Round Gānjā*. Speaking of the manufacture of *gānjā* in Bengal Mr. Hem Chunder Kerr says:—"In February and March, when *gānjā* attains its maturity, the cultivator proceeds to make arrangements for reaping the crop and preparing the drug. His first step is to present himself to the supervisor, show him the license under which he has grown the crop, and obtain his permission to remove the crop from the field." For flat *gānjā*, cutting of the plants commences in the morning; for round *gānjā*, in the afternoon, and by the Hindus Thursday, and by the Muhammadans Friday, is considered the best day for commencing operations.

GANJA.
342

Flai-Ganjá.—The stems are cut with a sickle about 6 inches above ground, and are tied together by their ends and placed across a bamboo, iration

Flat.
343

ration

1 OF 2

out a

If by

these,

twigs, are carefully picked out and first retained for next year's crop.

size. These are arranged on a mat in a circular form, with their points directed towards the centre and overlapping each other. The circle thus formed is the *10 feet square measure*. When the number of persons

firmly among the flowers in the desired form. Fresh twigs are then

mats are spread and the flowering twigs beaten two and two together so as to shake off the leaves or any fruits that may still remain and are re-arranged in a new circle, so that what was on the top before now forms the bottom

CANNABIS
sativa.

The Narcotic—Indian Hemp.

GANJA.

layer of the new circle. The treading is repeated stage by stage until the stack is again covered by the mats, and men take up their inexplicable seat on the top. After this each twig is trodden upon separately, being placed for that purpose on a canvas cloth; by sunset the process is completed for the day's manufacture. Next day the treading is repeated with slight modifications of little importance in the peculiar method followed. The ultimate result of all this labour is that the resin and flowers are firmly consolidated into flat patches near the apex of the twigs, and the leaves and fruit vessels (if such exist) carefully removed.

The twigs are then carried to the homestead and stacked, with the tips pointing inwards, and the stems thus exposed to be dried; when completed, the top of the stack is carefully covered in with mats.

Round.
344

Round Gánjá—In the manufacture of round *gánjá* greater care is bestowed. A larger amount of the twigs and leaves are rejected. Instead of being arranged in a circle, they are placed on the ground in a straight line and just below a bamboo bar, on which the men rest their arms and thus support themselves while treading. Instead, however, of tramping, they now roll twig by twig so as to force the resinous matter into the form of a thin sausage shape near the apex of the twig. This rolling is repeated several times, and the twigs even taken up in the hands and individually trimmed, superfluous leaves, &c., being picked out, and when loose the resin pressed into the desired form by the fingers.

Chur or rora
345

Gánjá powder or chur—When perfectly dry both the flat and round *gánjá* are next bailed in a prescribed manner, and during this operation a certain amount of loose particles of the resinous matter falls off: this is known locally as *chur*. Under the excise rules a separate rate is fixed for *chur*. It is held to be more powerful than round *gánjá*, and therefore the duty on it is R4 as compared with R3 a seer on round *gánjá*. The fragments which constitute *chur* cannot be made to adhere, and although prepared at one and the same time with the pressed or rolled *gánjá* and from the self-same plants, it is probable that these fragments exist in a slightly different chemical state, and probably more nearly resemble *charas* than *gánjá*. *Chur* is also known under the name of *rora*.

Mr. E. T. Atkinson (in his *Himalayan Districts*, p. 761) says of the *gánjá* of the N.-W. Provinces: "The *gánjá* produced in Kumaon and Garhwál is considered of little value, and is not, so far as I am aware, exported. The *gánjá* consumed locally is imported from the lower districts. Two sorts of *gánjá* are sold in these Provinces—the *pattar* and the *biláchar*. The *pattar* is imported chiefly from Holkar's territories and is of quality inferior to the Bengal *gánjá*. It is purchased at from R5 to 6 a maund in Indur in the rough state," and "pays a duty of about 4 annas per maund on exportation to British territory." It is sold retail at from R3 to 4 a seer. The *biláchar* variety is imported from Lower Bengal, and is sold at R10 to 12 a seer.

BOMBAY AND THE CENTRAL PROVINCES.

Although definite information cannot at present be obtained as to the details of the process of manufacture of *gánjá* as followed in the Central Provinces and Bombay, it is probable that it differs but slightly from that narrated above as pursued in Bengal. Dr. Irving, in his *Materia Medica of Patna*, however, informs us that there are two imitations of *gánjá*, or perhaps more correctly, of *charas*. The one is obtained by evaporating the expressed juice of the plant, and the other an extract obtained by boiling the whole plant. To what extent these adulterants are sold separately or mixed with the pure drug it is difficult to learn, but as far as Bengal is concerned, it may confidently be stated that adulteration can

IMITATIONS
OF GANJA.Expressed
Juice
346
Decoction
347

The Narcotic—Indian Hemp.

CANNABIS
sativa.

alone take place when the intoxicant reaches the hands of the dealer. In the *golas* it is quite pure.

The mention of *chur*, and of the extracts referred to by Dr. Irving, naturally lead to the consideration of—

(2nd) CHARAS.—This may be defined as the resinous substance which naturally exudes from the leaves, stems, and fruits of the hemp plant (see No 355) in more northern or higher regions where the plant is accordingly grown in a colder climate than that of the *ganja*-producing districts of the plains. In another page (No 377) it will be seen that Dr. Aitchison says that the resin collected from the leaves and flowers is in Turkistan called *nasha*—the *charas* of trade. Before being exported it is, how-

CHARAS.
348

practically two
writer that at
h white powder
by drawing the flowering twigs over a coarse cotton cloth spread on the ground. The crop is reaped about November and the powder stored in small 24lb bags. About May these are sold to the traders, who cut the bags open and spread out the now partially agglutinated powder on cloths under the sun. It softens and deepens in colour and is hard pressed into bags or bales 1½ maunds in weight (a half pony-load ready for exportation). The quality is judged of by the amount of oil seen through the degree of transparency in a fragment flattened on the hand until it is of the thickness of paper, or by rolling a small piece into a cord and exposing it to the sun for a few minutes. The oil is sucked on to the surface of the cord, the *charas* deepens in colour, but if pure, on being broken, is seen to be composed of minute granules of the appearance of pure steel. With age the oiliness is sucked out of the *charas* or by being exposed, it is then valueless. *Charas* is in Yarkand adulterated with linseed oil and a powder of the hemp leaves.

From the above description it would appear as if Yarkand *charas* was not the resinous exudation from the leaves and stems, as in Sind, Kash-

commonly reported that a very fine quality of *charas* known as *momes* is similarly prepared (See Church's Ed., Johnston's Chemistry of Common

MOMES
349

Residency that the word in the vicinity of the capital. Speaking of the modes of collecting *charas* as practised in Nepal, Dr Gimlette adds "I have been unable to verify the accounts of the collection of *charas* by means of leather coats worn by men who run

MOMES of
Nepal
350

The Narcotic—Indian Hemp.

CANNABIS
sativa.

In either case the *charas* thus collected is scraped off and made into the

CHARAS.
Trans H ma-
laya.
357

When the *thang* has been gathered and placed in a store-house as soon

Garda or
Panjab
Charas.
358
Surkhal,
Bhangra, and
Khaki
359

the *thang* which in the dust has been shaken out and settled on the cloth, the cloth is itself taken out and shaken, a dust falls down which is

needed
called
sh tint,
Lastly,
ken off,

forms the worst kind, called *khaki*.

(*grd*) *Bithna* or *Siddhi*, *Sabzi*, and *Sabzi*—Apparently the wild plant is the chief source of this form of the drug, which consists of the mature leaves and in some parts of India of the fruits also. The resin is apparently not extracted from these and sold or used in that form; the leaves are directly employed in the manufacture of the preparations in which *bhāng* constitutes the form of the narcotic. According to some *see Mr Atkinson's Himalayan* throughout India, of the retail in the provinces where duty sell and 4 annas (except in the N.-W. Provinces) where this is not the case, is of considerable importance when the disproportion in the revenue credited to Government from this article is taken into consideration

BHANG.
360

INDIAN PREPARATIONS FROM HEMP.

Smoking
mixtures,
361
Hashish,
362
Majun,
363

PRICES.

scraping duty. This is mainly due to
incapable to hold a man responsible for

the
and
the

CANNABIS
sativa.

The Hemp Fibre of India.

Bedding for
Cattle.

of affairs which prevails over a great part of India, and, indeed, on the lower slopes of the Himalaya and up to an altitude of 8,000 feet, the plant is often so plentiful as to be extensively used as bedding for cattle. The greatest difficulty exists, therefore, in regulating the consumption of *bháng*, but practically no such difficulty exists with regard to *gánjá* and *charas*. The last-mentioned narcotics can be produced only from the cultivated plant, and the consumption can therefore be regulated by law. The Excise Act provides that licensed persons may cultivate the plant, prepare the narcotics, and retail these to the consumer. The right to vend is sold by public auction, a person purchasing thereby the sole right, for one year, to all or so many of the shops in a district. Any person, other than a licensed dealer, having in his possession more than a very small quantity at one time is liable to prosecution and fine. This system of farming the wholesale and retail shops exists all over India,—Madras being an exception to the rule, since in South India, no revenue whatever is credited to Government from these drugs.

Excise
Arrangements.

The administrative arrangements which are made in each Province for levying excise uses on hemp will be found under the heading Narcotics.

FIBRE
364

THE FIBRE-HEMP.

The reader is referred to the account given of the cultivation of the hemp plant in a preceding page. It will there be found that a considerable amount of information has been given as to the early experiments made to extend the cultivation in India of *Cannabis sativa* as a source of fibre; a possible still further development has also, to a certain extent, been dealt with. It has been urged that the regions where the plant is grown for its narcotic, *gánjá*, should be carefully distinguished from those where the plant may be found to form fibre. But an equally important fact remains to be investigated and thereafter clearly kept in view, namely, the age of the plant and season of the year when the fibre is at its best, in both the temperate and tropical regions of India. It cannot be disguised that the defects complained of in many of the reports on Indian hemp cultivation, against the quality of the fibre produced, are traceable to ignorance as to the period when lignification is reached by the Indian plant. The season of sowing, period of repeating, and modes of culture, practised in Europe have, apparently, been forced on the plant in India, and the suggestion is accordingly offered that the brittle character complained of, against the resulting fibre, may have been due to the fact of the plant reaching in India the mature state of the fibre at an earlier stage of its growth than in European countries. Thus, for example, it is reported that the plants experimented with on the plains of India, at Saharanpur, grew vigorously, attained a height of 12 feet, and gave every promise of proving successful. When reaped, Dr. Falconer, however, reported that "the hemp-fibre did not retain the strength or flexibility which characterize it in the Himalayas." Similar results were obtained at Agra and in various parts of Bengal. The chemistry of fibre and of the process of fibre-forming within the plant has, during recent years, reached a high development. To arrive at a definite understanding as to whether the plains of India can or cannot produce good hemp, it would be necessary to carry out a series of systematic experiments in certain selected districts in each province. The seed would have to be sown and the plant cultivated according to a uniform and pre-arranged plan. From a certain stage, say after the plants had attained a height of two feet, a certain number of the plants from each field would have to be microscopically and chemically examined once a fortnight, right through

When
Mature.

Lignification.

Experiments
to be per-
formed in
India.

The Hemp Fibre of India.

CANNABIS
sativa.

FIBRE.

their subsequent growth, or until in each locality the period when lignification was reached by the plants had been determined. It would also be

to the present day, the experiments which have been made have either failed to discover such regions or were imperfectly conducted, for, with the exception of certain limited tracts of the Himálayas, no part of the plains of India can be said to have been discovered in which there is the least hope of hemp or flax cultivation becoming of much importance. (See remarks as to hemp in Godavery District No 339).

In portions of the North-West Himálaya the hemp plant has been cultivated for its fibre for a very long time. Mr. Atkinson gives a brief but practical account of this industry in his *Himalayan Districts* (p 799). "The possibility," says that author, "of attaining success in the cultivation of hemp in these provinces was pointed out by Dr. Roxburgh as early as 1800, and on the cession of these provinces, skilled Europeans were sent to carry on experiments in the Murádad and Gorakhpur districts. In Garhwál and Kumáon its cultivation was encouraged, and for many years the East India Company procured a portion of its 'annual investment from the Kumáon hills in the shape of hemp.' With the abolition of the Company's trade the cultivation languished and is now entirely dependent on the small

fibre of these provinces
water to promote
on being taken

Separation
of Fibre.

out they are better than those of the hill tribes, and by having a small portion of the fibre from the potatoes used for the swing bridges over hill-streams. The cloth makes an admirable material for sacks, and is largely used in the grain trade on the Nepal frontier, and latterly, in the export of potatoes from Kumáon. It also

plant is superior to that obtained from the female. It is urged that particular care should be taken to strip the plant in dry weather; should the fibre get wet, it is certain to heat and get almost totally spoiled. The method of plating the fibre into long tails as pursued by the hill tribes of India lessens the value of the fibre very much, since it increases the labour in clearing it.

Indian fibre.

many numerous substitutes for it which are often commercially grouped with the true article. Thus, for example, we have in India Sunn-hemp (*Crotalaria*

The Hemp Fibre of India.

... (San-
n com-
is, such
cana-

EUROPEAN place among became an article of extensive demand, nearly every country in the world

the fibre from the outer layer of the cocoanut), Manilla-hemp, cotton, and sunn-hemp. Italy produces the finest hemp; France is perhaps next in importance, then Great Britain, Servia, Germany, and of Asiatic countries China is reputed to produce good hemp.

INDIAN FOREIGN TRADE IN "HEMP."

The following figures as to the value of the Indian trade in "hemp" *Trade and Navigation of*
of the imports of raw-hemp *the imports of raw-hemp*
the exports Sunn-hemp:—

			Foreign Hemp imported.	Foreign Hemp exported.	Indian Hemp exported.
			R	R	R
Raw Hemp. 367	Raw Hemp	1881-82	1,10,875	...	5,59,112
		1882-83	1,82,993	...	4,30,325
		1883-84	1,76,765	...	6,85,316
		1884-85	2,14,118	...	5,82,679
		1885-86	1,96,052	...	9,88,825
Manufactures. 368	Manufactured Hemp (excluding cordage).	1881-82	10,179	4,182	1,409
		1882-83	27,090	8,857	3,176
		1883-84	32,570	4,548	6,510
		1884-85	41,356	150	3,129
		1885-86	42,810	323	3,205
Cordage. 369	Cordage	1881-82	3,22,485	24,686	3,25,173
		1882-83	4,31,693	15,586	2,84,106
		1883-84	3,90,584	11,198	4,92,663
		1884-85	3,52,413	13,076	3,53,389
		1885-86	3,24,519	7,437	3,28,320

Foreign Trade in Manufactured and Unmanufactured Hemp, excluding Cordage.

[illegible]

The Indian Hemp.

CANNABIS
sativa.

Detail of Imports, 1885-86.

FIBRE.
Imports.
370

Province into which imported.	Value.	Country whence imported.	Value.
	R		R
Bengal	1,33,235	United Kingdom	83,431
Bombay	1,01,600	China	1,23,474
Madras	1,183	Philippines	2,609
Sind	2,544	Straits Settlements	17,827
		Other Countries	11,521
TOTAL	2,38,562	TOTAL	2,38,562

Detail of Exports, 1885-86.

Exports.
371

Province from which exported.	Value.	Country to which exported.	Value.
	R		R
Bengal	3,11,551	United Kingdom	6,78,607
Bombay	6,31,444	Belgium	2,56,566
Madras	40,358	Persia	11,433
		Arabia	15,698
		Other Countries	30,044
TOTAL	9,82,353	TOTAL	9,82,353

It has been found impossible to give the quantities, since the raw fibre is expressed in weight, cloth in pieces, and rope in balls of various lengths and weights.

OIL.

Oil.—The seeds, when expressed, yield a pale, limpid oil. They contain 35 per cent. of oil. This oil is at first greenish or yellowish, but when it is exposed to the air it becomes brown and mild. It is, however, said to be of no use when boiled, and on this account it is never used in England, although it is used in India.

HEMP SEED
OIL.
372

gravity of 0.9252 at 15 C.; it thickens at —15°C, and solidifies at —25°C to —27°C. It dissolves in boiling hot water and in 30 parts of cold alcohol.

MEDICINE.

MEDICINE.
373

CANNABIS
sativa.

The Indian Hemp as a Drug.

MEDICINE.

tice has greatly decreased of late years owing to a feeling of insecurity as to the quality of the article. It is commonly recorded that no reliance can be put upon the uniformity in strength. The writer, at a meeting of the Royal Pharmaceutical Society of Great Britain, recently expressed the opinion that the heavy fiscal restrictions now imposed on Bengal *gánjá* had, in all probability, diverted the export trade from Bengal to Bombay, so that, instead of the carefully-cultivated Bengal article finding its way to Europe, the much inferior but infinitely cheaper *gánjá* of Bombay and the Central Provinces was, in all probability, that which was now used in European pharmacy. The *Chemist and Druggist*, commenting on this subject shortly after, recommended the suggestion as worthy of attention, and added: "The price of Bengal *gánjá* may be prohibitive, but the whole subject should be considered by authorities." There would seem little doubt that the high reputation the drug once enjoyed might be recovered by greater care in selecting the article, but there is perhaps no other commodity in India that is produced in a larger number of forms and qualities, or which in the hands of the retail dealer is subjected to a greater degree of adulteration. The only guarantee an exporter can have is to purchase his *gánjá* direct from the Government *golá* of Bengal, not even allowing the article to pass through the hands of a wholesale *gánjá*-dealer or "middle-man" of any kind. If the article be shipped under a permit direct from the *golá* it is believed little complaint would be raised as to the uniformity in strength, but none but that which is registered as of the first quality should be purchased for medicinal purposes. From what the writer has been able to learn it would be even preferable to use for European pharmacy the *chúr* or the dust obtained on packing and handling round *gánjá* rather than round *gánjá* itself; flat *gánjá* should be resorted to with caution, and *charas*, or *momea*, should never be employed, nor round *gánjá* in which ripe fruits are found with the flower heads.

Medicinal Properties and Uses of Indian Hemp.—The *Pharmacopœia of India* describes the drug as primarily stimulant, and secondarily anodyne, sedative, and antispasmodic. It is also said to be narcotic, diuretic, and parturient. It has been used with advantage in tetanus, hydrophobia, delirium tremens, ebrietas, infantile convulsions, various forms of neuralgia, and other nervous affections. It has also been employed in cholera, menorrhagia and uterine hæmorrhage, rheumatism, hay fever, asthma, cardiac functional derangement, and skin diseases attended with much pain, and pruritus. In lingering and protracted labours depending upon atony of the uterus, it has been employed with the view of inducing uterine contractions.

It is admitted by most Indian physicians to be of special merit in the treatment of tetanus and cholera and has not the injurious after-effects (constipation and loss of appetite) which but too frequently result from the use of opium. Its action is, however, very similar to that of opium, and it is accordingly stated that a habitual opium-eater may take large quantities of hemp without injurious consequences.

Sir William O'Shaughnessy was the first European writer to draw prominent attention to the peculiar properties and actions of the hemp-narcotics. He experimented with these in Calcutta and published his results. The reader is referred to his *Bengal Dispensatory* and to a "Memoir on the preparations of Indian Hemp" in the *Transactions of Medical and Physical Society of Calcutta* for 1839, and to two papers in the *Journal of the Asiatic Society*, Vol. VIII., of the same year. Shortly after the appearance of these most exhaustive accounts, the drug began to be experimented with in Europe.

Chúr or Round
Ganja best
suited for
Pharmacy.
Flat Ganja
and Charas
should be
avoided.

The Indian Hemp as a Drug.

CANNABIS
sativa,

MEDICINE.

int of
in, in
nux-
Sind

is that known as *bubakai*, from the town of Bubak near lake Manchhar. He further adds that the *majum* of Sind is made up of some 20 to 30 different ingredients, of which datura and opium are frequent. In some parts of India a beer is brewed with *bháng*, and this, together with *bháng* itself, *majum* and other preparations, are often employed in Native pharmacy.

remarks, derived
or some years,"
from Calcutta
e pain, obtain

in sufficient doses. The uncertainty is, to be always sure of the quality of the extract, or rather of the *ganjá* from which the extract is obtained.

Uniformity in
quality.

(*charas*)

The
at by th
Alakhsan, "the leaves make a good
juice applied to the head removes
ear it allays pain and destroys we
thems and gonorrhea, and is it

are the subject of
oduces a ravenous
that of the liver,
forgetfulness of all
ion, that the be-

are often senseless for a

Sanskrit writers, "the
ly being boiled in milk

Leaves.
376

C. 376

CANNABIS
sativa,

The Indian Hemp as a Drug.

MEDICINE.

before use. They are regarded as heating, digestive, astringent, and narcotic. "In sleeplessness, the powder of the dried leaves is given in suitable doses for inducing sleep and removing pain."

Special Opinions—§ "Used as anodyne, antispasmodic, diuretic, leaves may be employed in dose of 20 grains" (*Assistant Surgeon Nehal Singh, Shaharanpur*). "During the last twelve months I have used Cannabis sativa with great success in the treatment of acute dysentery; similar results were obtained by other medical officers of this station, who tried it at my request. The dose was, of the tincture 15 or 20 m. three times a day" (*Surgeon S. J. Reenie, Cawnpore*). "I have found a poultice of the bruised fresh leaves, slightly warmed, very useful in affections of the eye, attended with photophobia. Natives also use the poultice in piles" (*Assistant Surgeon Bhagwan Dass (2nd), Panjab*). "The resin collected from the leaves and flowers in Turkestan is called *Nasha*, and this ought to be the *Charas* of the trade, but it is terribly adulterated. The plant is called in Turkestan *kandir*, and the oil, *kandir yak*. The oil extracted from the seed is in Kashmir considered as a valuable remedy, applied by rubbing in rheumatism" (*Surgeon-Major F. E. T. Astleison, Simla*). "Used in the form of '*sidihi*,' in small quantities, it is a very good stomachic tonic, useful in atonic dyspepsia and diarrhoea. In large quantities exhilarant at first, depressant subsequently. Long continued use of *ganja* is a prominent cause of insanity" (*Civil Surgeon D. Basu, Faridpur*). "Used to produce sleep in certain cases in which opium is contra-indicated. It does not induce nausea, constipation, or headache as opium does. Valuable as a remedy for sick headache, and especially in preventing such attacks. It removes the nervous effects of a malady. Useful in malarial, periodical neuralgias. Valuable in the treatment of the sleeplessness and restlessness of acute mania, in whooping-cough, and in asthma, in dysuria, and in relieving pain in dysmenorrhoea" (*Dr E. G. Russell, Superintendent, Asylums, at Presidency General Hospital, Calcutta*). "Commonly used is a narcotic, a few grains of the leaves called *nadhi* rubbed in with cardamom and other spices to allay pain, taken as a drink habitually by many for intoxicating purposes, may be used as an anodyne; it increases appetite, is an aphrodisiac, and increases the activity of the brain, producing better flow of thoughts, and deep meditation, but often wild reveries and causeless laughter. A small quantity of the leaves, mixed with other drugs and spices, forms a useful compound in diarrhoea and indigestion of children" (*Assistant Surgeon Shub Chunder Bhattacharya, Chanda, Central Provinces*). "The leaves, which are known as *bhang*, are used to check diarrhoea; an extract is prepared from them; it is made into confection and used for narcotic purposes" (*Surgeon Major Robb, Civil Surgeon, Ahmadabad*). "Used for asthma and in tetanus, dose $\frac{1}{2}$ to 2 grains, with sugar well fried in ghee and mixed with black pepper, given, in cases of chronic diarrhoea, with poppy seeds in dysentery, with *isfahan* in hysteria" (*Surgeon W. Birren, Bhuj, Cutch*). "Very often used by natives in some parts of this Presidency as an aphrodisiac and I believe in some cases successfully, in the form of '*Majan*,' i.e., a kind of pill-mass containing various drugs" (*Surgeon D. N. Parakh, Bombay*). "The leaves made into a poultice used in orchitis, also dried leaves warmed and used for fomentations" (*Civil Surgeon S. M. Surcott, Murshidabad*). "Used frequently by all hospital assistants particularly for asthma and other paroxysmal affections. In cases of epilepsy I have found the extract in one-grain doses with $\frac{1}{2}$ grain of opoeac to produce wonderful effects" (*Dayal Gauder Spence, Campbell Medical School, Serikhat, Calcutta*). "More commonly used in this country to produce intoxicating effects than for its medicinal properties in smaller doses."

Dysentery.

Affections of
the eye.
Piles.NASHA.
377Oil used in
Rheumatism.

Acute Mania

Hysteria.

Orchitis.

Asthma.
Chronic Cough.

The Indian Hemp as a Drug.

CANNABIS
sativa

MEDICINE

Ague Fits
ImpotenceCHEMICAL
COMPOSITIONCannabene
378

(Dr G Price, Civil Surgeon, Shahabad) "It is also used in the form of a powder, in which it acts as a cholagogue" (Civil Surgeon J H Thornton, B A, M B, Monghir) "Dried tender leaves and flowering tops with sugar, black pepper powder, and with or without opium, proves highly beneficial in dysentery" (Civil Surgeon E W Savinge, Rajamundry, Godavari District)

Chemical Composition—"The most interesting constituents of hemp, from a medical point of view, are the Resin and Volatile Oil

"The former was first obtained in a state of comparative purity by T and H Smith in 1846. It is a brown amorphous solid, burning with a bright white flame and leaving no ash. It has a very potent action when taken internally, two-thirds of a grain acting as a powerful narcotic and one grain producing complete intoxication. From the experiments of Messrs Smith it seems impossible to doubt that to this resin the energetic effects of Cannabis are mainly due

"When water is repeatedly distilled from considerable quantities of hemp, fresh lots of the latter being used for each operation, a volatile oil lighter than water is obtained together with ammonia. This oil, according to the observations of Personne (1857) is amber-coloured, and has an oppressive hemp-like smell. It sometimes deposits an abundance of small crystals. With due precautions it may be separated into two bodies, the one of which named by Personne *Cannabene* is liquid and colourless, with the formula $C_{19}H_{20}$, the other which is called *Hydride of Cannabene*, is a solid, separating from alcohol in platy crystals to which Personne assigns formula $C_{19}H_{22}$. He asserts that *Cannabene* has indubitably a physiological action, and even claims it as the sole active principle of hemp. Its vapour he states to produce when breathed a singular sensation of shuddering, a desire of locomotion, followed by prostration and sometimes syncope. Bohling in 1840 observed similar effects from the oil which he obtained from the fresh herb, just after flowering, to the extent of 0.3 per cent

"It remains to be proved whether an *alkaloid* is present in hemp, as suggested by Preobraschensky

The other constituents of hemp are those commonly occurring in other plants. The leaves yield nearly 20 per cent of ash

"As to the resin of India, it is converted into nitric acid, converted it into substance may, they say, be dissolved in methylic alcohol. Its chemical composition, it is neutral, and is obtained from purified resin of chara

Pharmacog, page 549)

Dr Dymock (in his 2nd Ed of the *Materia Medica of Western India*) goes into considerable detail on the chemistry of this drug. Preobraschensky discovered in China *haschisch*, a volatile alkaloid which he believed to be identical with nicotine. Dragendorff and Marquiss

these published results of the chemical investigation of the narcotic resin |

C. 378

CANOES.

The Indian Hemp Canoes.

of *Cannabis sativa*, Drs. Warden and Waddell of Calcutta have failed to

oil contained phenol, ammonia, and several other of the usual products of destructive distillation.

"The nicotine-like principle contained in this oil appeared to be an alkaloid. It formed salts which evolved a strong nicotine-like odour when acted on by alkalis. But physiologically it was found to be inert, and therefore was evidently not identical with nicotine" (*Ind. Med. Gaz.*, Dec. 1884).

FOOD.

FOOD.
379

Food.—Messrs. Duthie and Fuller, writing about the Himáláyan tracts within the North-Western Provinces, say that the seed is not uncommonly roasted and eaten by the hill-men, and that after the oil is expressed the oil-cake is given to their cattle. Dr. Stewart writes that on the Sutlej the seeds are roasted and eaten in small quantities with wheat.

DOMESTIC AND INDUSTRIAL USES.

DOMESTIC.
380

Cannabic Composition.—"This material for architectural decoration is described by Mr. B. Albans to have a basis of *hemp* amalgamated with resinous substances, carefully prepared and worked into sheets of large dimensions. Ornaments in high relief and with great sharpness of detail are obtained by pressure of metal discs, and they are of less than half the weight of *papier-mâché* ornaments, sufficiently thin and elastic to be adapted to wall surfaces, bearing blows of the hammer and resisting all ordinary actions of heat and cold without change of form. Its weather qualities have been severely tried in Europe, as for coverings of roofs, &c., remaining exposed without injury.

This composition is of Italian origin, and in Italy it has been employed for panels, frames, and centres. It is well fitted to receive bronze, paint, or varnish; the material is so hard as to allow gold to be burnished after gilding the ornaments made of it" (*Urc.*, I., 611).

CANOES.

See Boats, Vol. I., B. 548.

381

TIMBERS USED FOR CANOES, DUG-OUTS, TROUGHS, WATER-PIPES, DRINKING CUPS, &c.

1. *Acer castum*, Wall. (drinking cups made in Tibet).

2. *A. oblongifolium*, Wall.

3. *A. pictum*

4. *Adina*

5. *Escal*

6. *Ailanth*

7. *Amor*

8.

9.

10.

11. *Bumelia*

12. *Bumelia*

are used for canoes).

11. *Bumelia* *regia*, Wedd. (Lepchas make cups, bowls, and tobacco-boxes).

C. 381

Woods used for Canoes, Dug-outs, &c

CANSCORA
decussata

- 12
13
14
15
16
17
18
19
20 *Dipterocarpus alatus*, Roxb (canoes)
21 *D. tuberculatus* Roxb (Burma canoes)
22 *D. turbinatus*, Roxb (Burma canoes)
23 *Drumycarpus racemosus*, Hook (mostly used in Chittagong for boats and canoes)
24 *Duabanga sonneratioides*, Buch (canoes, cattle troughs cut out of green wood)
25 *Dysoxylum Hamiltonii* Hiern (canoes)
26 *D. procerrum* Hiern (Assam canoes)
27 *Givotia rottleriformis* Griff (catamarans)
28 *Gmelina arborea* Roxb (clogs, canoes &c)
29 *Gyrocarpus Jacquini*, Roxb (preferred above all other woods for catamarans)
30 *Hopea odorata* Roxb (Burma canoes)
31 *Juniperus excelsa*, M. Bieb (drinking cups)
32 *Lagerstrœmia Flos Regiæ*, Retz (boats and canoes)
33 *L. tomentosa* Presl (canoes)
34 *Mangifera indica*, Linn (canoes and masula boats)
35 *Michelia Champaca* Linn (Assam canoes)
36 *Michelia oblonga* Wall (Assam canoes)
37 *Morus serrata*, Roxb (troughs)
38 *Odiaa Wodier*, Roxb (Rice-pounders)
39 *Pajaoelia multijuga*, DC (Andaman Island canoes)
40 *Phoenix sylvestris* Roxb (water tubes)
41 *Pinus excelsa*, Wall (water-channels)
42 *P. Gerardiana*, Wall (hollowed out for water-courses)
43 *Platanus orientalis* Linn (trays)
44 *Populus ciliata* Wall (water troughs)
45 *Sarcosperma arborea* Hook (Sikkim canoes)
46 *Schima Wallichii* Choisy (Assam canoes)
47 *Shorea obtusa*, Wall (canoes)
48 *S. robusta*, Gertn (Hills of Northern Bengal, canoes)
49 *S. stellata* Dyer (canoes)
50 *Stereospermum chelonoides* DC (Assam canoes)
51 *Terminalia bellerica*, Roxb (canoes in South India for catamarans)
52 *Vateria indica*, Linn (occasionally used for canoes)

CANSCORA, Lam, Gen Pl, II, 811

382

Canscora decussata, R & Seb, Fl Br Ind, IV., 104, Bot Mag,
t 3066, GENTIANACEÆ

Syn PLADERA DECUSSATA Roxb, Fl Ind, Ed C, B C. 135

Vern — Sankhahuti HIND, Dankuni, BENG, Shun khapushoppa CUTCH,
Sankhapushpa danaotpala SANS

References — Twissies En Ceylon Pl, 204 1801, Hort Emb Cat 520
U C Dutt Mat Med Hind, 201, 296, 316, Dymock, Mat Med, IV
Ind, 451, also 2nd Ed 542

CANTHIUM
didymum.

Cantharides; Canthium

MEDICINE
383

Habitat — Common throughout India from the Himalaya to Burma, ascending to 4,000 feet, is abundant in the plains of Bengal and not uncommon in Ceylon.

Medicine — This plant is regarded as laxative, alterative, and tonic, and is much praised as a nervine tonic. Used in insanity, epilepsy, and nervous debility. In the last two cases, in doses of the extract taken *Mel Ind 251*.

Special Opinions — § "This deserves a trial" (*Surgeon-Major C F McKenna*) "Laxative, tonic, expectorant" (*Dr W Barren, Bhuj, Cutch*).

384

Canscora diffusa, *Dr, Fl Br Ind, IV, 103, Wright, Ic, 1 1327* (not [of Clarke])

Syn — *PLADERA VIROATA*, *Roxb, Fl Ind, Ed C B C, 134*

Vern — *Ayauk pan*, *Burm*

References — *Thwaites, Fl Ceylon Pl, 204; Dalt and Gibs, Bomb Fl, 159; Wright, Hort Sub Cal, 520*

Habitat — Common throughout India, ascending to 4,000 feet, from Kumbhon and Bhutan to Ceylon and Peninsular

Medicine — Used as a substitute for *C. decussata*

MEDICINE
385
386

C. sessiliflora, *Roem and Sch, Fl Br Ind, IV, 104*

387

CANTHARIS, Latreille

Cantharis vesicatoria, *Latreille, COLEOPTERA*

CANTHARIDES, BLISTERING BEETLE, SPANISH FLIES, *Eng*,
MOUCHES DESPAGNE *Fr* SPANISCHE FLIEGEN, *Germ*,
CANTERELLE, *It*; HISCHEPANSKIE MUCHI, *Rus*, CAN
THARIDES, *Sp*

Blistering
Insect
388

References — *Pharm Ind, 274; U S Dispens 15th Ed 343 Spens, Encyclop, 796 Balfour, Cyclop, Ure & Dic of Arts and Manufactures*

Habitat — A dried insect imported into India and sold by chemists. For indigenous insects used as substitutes see *Mylabris cichoru, Fabr*

389

CANTHIUM, *Lam, Fl Br Ind, III, 131.*

The *Genera Plantarum* reduces the above genus to *PLECTRONIA* *Linn*, but *CANTHIUM* has been retained in the *Flora of British India*, which puts *PLECTRONIA* (in part) under *CANTHIUM*

390

Canthium didymum, *Roxb, Fl Br Ind, III, 132, RUBIACEÆ*

Vern — *Garbha gejha* *SANTAL* *Yerkoli, TAM* *Yellal porawa mard, Gal kara vada* *SING KAN*

References — *Roxb Fl Ind Ed C B C 180 Kurz Fl Burm, II, 359 Thwaites En Ceyl Pl, 152 Bom Gaz XV 65*

Habitat — A shrub or small tree found in the Sikkim Himalaya at an altitude of 1,500 feet and distributed east to the Khasia and Jyntia mountains. It also is met with in Chutia Nagpur and in the Western Peninsula from the Concan southwards to the Malay Peninsula and Ceylon

C. 390

Canthium: Canvas.

CANVAS.

Medicine.—Bark used by the Santals in fever (Rev. A. Campbell).
 Structure of the Wood.—Hard, heavy, and close-grained; yellowish, with central masses of black. (Bomb. Gar.) This is very much like the description of the wood, as given by Brandis and by Lisboa for *C. umbellatum*.

MEDICINE.
 301
 TIMBER.
 392

Canthium parviflorum, Lark; Fl. Br. Ind., III., 136

Syn.—*WYPERA TETRANGRA*, Willd.; KAKOEN KAKA in Rhede, Hort. Mal., V., t. 36.

Vern.—Kunt, BOMB; Karai-cheddi, TAM.; Tajiron kard, MAL.; Balusu, chetti, Laka, TEL. (Ainslie), Adra, SING.

References.—Roxb, Fl. Ind., Ed. C. B. C., 179; Gamble, Man. Timb., 230, Ainslie, Mat. Med., II., 61; Dymock, Mat. Med., W. Ind., 713, and 2nd Ed., 209, Lisboa, U. Pl., Bomb., 162; Thwaites, En. Cey. Pl., 152; Trimen's Cat., Ceyl. Pl., 44.

Habitat.—A shrubby plant met with at altitudes of 4,000 feet, in the Western Peninsula from the Concan southwards to Ceylon.

Medicine.—Ainslie says "A decoction of the edible leaves, as well as

MEDICINE.
 394

FOOD
 395
 TIMBER.
 396
 397

C. umbellatum, Wight, Ic., t. 1034; Fl. Br. Ind., III., 132.

Syn.—*PLECTONIA DIDYMA*, Benth. & Hook; Brandis, For. Fl.

Vern.—Arsul, BOMB; Neckanie, nalla, balsi, TAM. & TEL.; Abalu, KAN; Tolan, URIYA.

References.—Brandis For. Fl., 276, Bedd, Flor. Syl., 221; Dals & Gibs, Bomb. Fl., 113; Gamble, Man. Timb., 230 (under *Plectonia didyma*, Benth. & Hook); Lisboa, U. Pl., Bomb., 67.

Habitat.—An evergreen tree met with in the Western Peninsula (on the Ghats at altitudes of 4,000 to 8,000 feet) and distributed south to Tenasserim and Ava.

Structure of the Wood.—Hard, close-grained, and heavy, yellowish white or chocolate-coloured with irregular masses of black wood in the centre (Brandis). According to Gamble, the wood is grey, hard, with very small, numerous and uniformly distributed pores, medullary rays fine and numerous. Gamble makes no mention of the irregular masses of black wood (Compare with *C. didymum*). Weight 57lb a cubic foot.

Timber is used for agricultural purposes

TIMBER.
 398

CANVAS.

Canvas.

399

SAILCLOTH, Eng; KANEVAS and SEGELTUCH, Germ.; CANEVAS and TOILE-A-VOILE, Fr; ZEHDOK, Dut; LONA, It, Port, Sp; CANEVAZZA, It, Port; PARUSSINA, PARUSSNOE POLOTNO, Rus; KITTAN, Tam., Tel.

pared is employed by artists for painting on.

CAPPARIS
aphylla.

Caoutchouc. The Caper-berry.

Sails are usually made with the salvages and seams of the canvas running in the middle, and they are very strong, and be oblique in the edges. Messrs. Messrs. the manufacture of the cloth weaving the canvas with diag

400

In India the principal seats of canvas manufacture are Pondicherry, Cuddalore, and Travancore, where it is sold in bolts of 40 yards at from Rs 20 to Rs 25 the bolt; the coarser kinds selling from Rs 8 to Rs 15. A still coarser description of hard brown canvas is also produced in Bengal. In the Madras Presidency, excellent cotton canvas is manufactured by combining two or more threads together in the loom (*Balfour, l. 573*). Although originally, as stated, the term 'canvas' appears to have been restricted to a hemp or flax textile, it has been found possible to meet certain purposes of canvas by the manufacture of a fabric of jute or other pure or mixed fibres; this modern commercial textile is also designated as canvas. (*See Jute and Cannabis sativa*).

401

CAOUTCHOUC.

Caoutchouc is in England generally restricted to mean the pure hydrocarbon isolated from the other materials with which it forms the impure rubber of commerce. *See India-rubber*.

Capillare. *See Adiantum Capillus-Veneris, Linn.; FILICES, Vol. I.*

402

CAPPARIS, Linn.; Gen. Pl., I., 108.

Capparis aphylla, Roth.; *Fl. Br. Ind., I., 174; CAPPARIDÆ.*

Vern.—Korél, kerd, kurrél, lete, karu, HIND; Kari, BEHAR, BOMB.;

... ..

... ..

... ..

... ..

and Pa.

Reference

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

... ..

Habitat.—A dense, branching shrub of the Panjáb, of the North-western Provinces, and of the

... .. on powder to relieve toothache when chewed. "The plant is reckoned as heating and aperient; useful in boils, eruptions, and swellings, and as an antidote to poison; also in affections of the joints." Dr. Dymock says that the plant possesses somewhat similar properties to *C. spinosa*.

Special Opinions.—"The fruit when eaten causes obstinate constipation. It is used largely in the Harriana and Karnal districts as an

C. 403

MEDICINE.
403

The Capér-berry.	CAPPARIS horrida
astringent" (Surgeon-Major C W Calthrop, Morar) "The bark is described as bitter and laxative, and is said to be useful in inflammatory swellings" (U C Dutt, Serampore)	FOOD 404
Food—Dr Stewart remarks that the buds are cooked when fresh as a	Buds 405
year, and is eaten to an ounce or two at a time, usually with bread The ripe fruit is generally made into pickle with mustard or other oil (Hindus are not allowed to use vinegar), to be eaten with bread" The young flower-buds are preserved as pickle	Fruit. 406
Special Opinions—§ "The fruit is eaten" (G A Watson, Allahabad) "The flower-buds are made into pickle as a condiment" (Surgeon Major J E T Atchison, Simla)	Pickle. 407
Structure of the Wood—Light yellow, turning brown on exposure, shining, very hard and close grained, weight 53lb per cubic foot Used for main beams and rafters in roofs, for the knees of boats, for	Flower-buds. 408
burning" (Drury)	TIMBER. 409
Capparis grandis, Linn f, Fl Br Ind, I, 176	Not eaten by white-ants,
Syn—C BISPERMA, Roxb, Fl Ind, Ed C B C, 425	410
Vern—Puchomnda ragola, BOMB, Kauntel, MAR, Jellai toarati, maram TAM, Guli regguti, ragola gullem chellu, regutti, TEL, Tarate, KAN Waghutty MALA Hkaw-kwa BURM	OIL. 411
References—Kurz For Fl Burm, I, 64 Gamble Man Temb, 15, Thwaites Enum Ceylon Fl 16 Dals & Gibs, Bomb Fl, 10, Lisboa, U Pl, Bomb, 5, Balfour, Cyclop	TIMBER. 412
Habitat—A small tree of the Chanda district and of the eastern part of the Dekkan, the Eastern Ghâts and Carnatic, the Prome district in Burma, and the north-east of Ceylon	413
Oil—"Yields an oil which is used in medicine and for burning" (Bomb Gas, XV, 65)	MEDICINE 414
Structure of the Wood—White moderately hard durable; weight 46lb per cubic foot Much used by the natives in the Madras Presidency for plough shares and rafters Roxburgh says it is 'heavy, hard and durable, the natives employ it for various purposes" Kurz remarks that in Burma it is regarded as good for turning	Leaves. 415
C. Heyneana, Wall, Fl Br Ind, I, 174	Flowers. 416
Vern—Chayruka HIND	C. 416
References—Dals & Gibs, Bomb Fl, 9, Balfour, Cyclop	
Habitat.—An erect shrub distributed from the South Konkan and Kanara to Travancore, also met with in Ceylon	
Medicine—The leaves are used for rheumatic pains in the joints, and the flowers are made into a laxative drink	
C. horrida, Linn f, Fl Br Ind, I, 178, Wight, Ic, t 173	
Syn—C ZYLANICA, Roxb, Fl Ind, Ed C B C, 425	
Vern.—Ardanda HIND, SIND DUK, Ulla kanta Kawkwa kanta, KAMAON; Hia, kareila, hian garna, P, Karralura, OUDH; Ka cent,	

The True Caper-berry.

CAPPARIS
spinosa.Capparis spinosa, Linn.; *Fl. Br. Ind.*, I., 173.

431

THE EDIBLE CAPER.

Syn.—C. MURRAYANA, *Graham*; *Wight*, *Is.*, t. 379.

Vern.—*Kabra, ber*, HIND; *Kábra*, LADAK, TIBET; *Ulla kanta*, KUMAON; *Kaur, kiari, bauri, ber, bandar, bassar, kakri, kander, taker, barar, keri, kabra, kabarra, barari, bauri, Pb, Kalvari*, SIND; *Kabar*, BOMB.; *Kabarra, kabarra*, AFG.; *Kabar, kabur*, ARAB; *Kebir*, PERS. (In Persia it is known as *Kabar, kurak*) *Kabar*, SYRIAN; *Kabarish*, TURKISH.

P. C. — — — — — P. C. — — — — — P. C. — — — — — P. C. — — — — —

Habitat.—This is the plant which affords the Caper berry of Europe. It occurs in India in the central and northern parts of the Panjab and in Sind, is less frequent in Rajputana than *C. aphylla*.

Medicine.—Dr Stewart remarks that in Kangra the roots are said to be applied to sores. The author of the *Makhzan-ul-Adwiyā* considers the root bark "to be hot and dry and to act as a detergent and astringent."

MEDICINE.

Roots.

432

Root-bark.

433

Julee.

434

Buds.

435

diameter, transversely wrinkled, grayish externally, whitish within, inodorous, and of a bitterish, somewhat acid, and aromatic taste. It is considered diuretic, and was formerly employed in obstructions of the liver and spleen, amenorrhœa, and chronic rheumatism."

Chemical Composition.—"The root-bark is said to contain a neutral bitter principle of sharp irritating taste, and resembling senegin. The flower-buds, distilled with water, yield a distillate having an alliaceous odour. After they have been washed with cold water, hot water extracts from them Capric acid ($C_{10}H_{18}O_2$), and a gelatinous substance of the Pectin group. Capric acid is sometimes found deposited on the calices of the buds in white specks having the appearance of wax (*Rochleder and Blas*)" (*Watts' Dict., Chemistry*).

CHEMISTRY.

436

Food.—In Europe this furnishes the Caper. Mr. Edgeworth found the buds (prepared in the style of "Capers") to answer very well as a substitute for the European congener. In India the ripe fruit is either eaten raw or made into pickle. In Sind and in some parts of the Panjab, a compound of oil, mustard, scenu-greek, &c., is used in pickling capers. In Ladak the leaves are eaten as greens.

FOOD.

437

Berries.

438

Pickle.

439

Leaves.

440

Fodder.—The leaves and ripe fruits constitute a favourite food of goats and sheep.

FODDER.

440

CAPSICUM
annuum.

Capsicum or Red Pepper.

441

Capparis zeylanica, Linn.; *Fl. Br. Ind.*, I., 174.Syn.—*C. ACUMINATA*, Roxb., *C. BREVISPIA*, DC.Vern.—*Kalo-kera*, BENG; *Authoondy kai*, TAM.References.—*Voigt, Hort. Sub. Cal.*, 74; *Dals. & Gibs., Bomb. Fl.*, 9; *Balfour, Cyclop.*FOOD.
Pickie.
442

Habitat.—Common in the Carnatic and Malabar, occasional in the Western Dekkan and in the drier parts of Ceylon.

Food.—The green fruit is pickled.

CAPSELLA, *Manch.*; *Gen. Pl.*, I., 86.

443

Capsella Bursa-pastoris, *Manch.*; *Fl. Br. Ind.*, I., 159; CRUCIFERÆ.SHEPHERD'S PURSE; PICKPOCKET, *Eng.*; BOURSE DE PASTURE,*Fr.*; HIRTENASCHE, *Germ.*

Habitat.—A weed in the vicinity of cultivation throughout the temperate regions of India; particularly abundant on the N. W. Himalaya.

MEDICINE.

444

Medicine.—“This very common weed is bitter and pungent, yields a volatile oil on distillation, identical with oil of mustard, and has been used in hemorrhages, as well as

OIL.

17).

e ignorant of the uses of
ects at least, alludes to it.

FOOD.

445

446

Balfour says it “grows in Europe, Persia, Asia, and Japan, used by the natives as a pot-herb.”

447

CAPSICUM, Linn.; *Gen. Pl.*, II., 892.

448

Capsicum annum, Linn.; *DC Prodr.*, XIII, *Pl.*, 412; SOLANACEÆ.

RED PEPPER.

Vern.—*Maltisa*, *wongrá*, *lál mirch*, *marcha*, *mirch*, *gáchmirch*, HIND

BURM.

References.—*Roxb., Fl. Ind.*, Ed. C B C, 193; *Stewart, Pb. Pl.*, 156; *DC Orig. of Cult. Pl.*, 289; *Voigt, Hort. Sub. Cal.*, 510; *Pharm. Ind.*, 11; *Eng. & Austr. Pharm.*

Capsicum or Red Pepper.

CAPSICUM
annuum.

Habitat—A native of equinoctial America, most probably of Brazil. Commonly cultivated for its fruit throughout the plains of India, and on the lower hills such as in Kashmir, and in the Chenab valley up to altitude 6,500 feet. When grown on the hills it is said to be very pungent. There are seven varieties, differing chiefly in the length, shape, and colour of the fruit, some being round, others oblong, obtuse, pointed or bifid, smooth or rugose, and red, white yellow, or variegated. It is probable that most Indian authors have confused this species with *C. minimum*, which see.

History—"This species has a number of different names in European languages, which all indicate a foreign origin, and the resemblance of the taste to that of pepper. In French it is often called *poivre de Guinée* (Guinea pepper), but also *poivre du Brésil, d'Inde* (Indian, Brazilian pepper), &c., denominations to which no importance can be attributed. Its cultivation was introduced into Europe in the sixteenth century. It was one of the peppers that Piso and Maxgraf saw grown in Brazil under the name *quiya* or *quiya*. They say nothing as to its origin." (*DC Orig of Cult Pl*) "Chillies are not mentioned by any Sanskrit writer, consequently their introduction into India must have taken place at a comparatively recent date. It is probable that the Portuguese brought the fruit from the West Indies. Up to the present time the cultivation of the plant is carried on more extensively at Goa than at any other place on the western coast and capsicums are well known in Bombay by the name of *Goa's mirchi* (Goa pepper)" (*Dr Dymock, Mat Med W Ind*). Howe alludes to Capsicum as grown in Bombay in 1787 and expresses no astonishment at its existence in India.

CULTIVATION OF CAPSICUMS—"A light well manured soil is the best for all kinds in which the plants should be picked out at about four inches out out giving (The

449

450

Gardener)

Medicine—Dr Stewart says that the fruit is used externally in the form of plasters and taken internally in cholera, it is eaten from a conviction that it counteracts the effects of bad climates.

As a drug, red pepper is considered by the natives as stomachic and stimulant, and is used externally as a rubefacient (*Dymock*). "It has been employed with success as a topical application to elongated uvula and relaxation of the pendulous veil of the palate. Made into a lozenge with sugar and tragacanth, it is a favourite remedy for hoarseness with professional singers and public speakers. In putrid sore throat whether symptomatic or strictly local gargles of an infusion of red pepper are often very usefully resorted to" (*O Shaughnessy Beng Dispens*, 468). "It is employed in medicine in combination with cinchona in intermittent and

MEDICINE
Plaster.
451

Lozenge.
452

success in the advanced stages of rheumatism. In native practice it is
cholera By
in gonor-

snake-bite

stimulant in

Chemical Composition—"Bucholz, in 1816, and about the same time Braconnot, traced the acidity of capsicum to a substance called *capsicin*

CHEMISTRY.
453

C. 453

CAPSICUM
annuum.

Capsicum or Red Pepper.

CHEMISTRY.

It is obtained by treating the alcoholic extract of ether, and is a thick substance consisting of resinous and fatty matters. It is evidently a mixed substance consisting of resinous and fatty matters.

"Fellietar, in 1869, exhausted capsicum fruits with dilute sulphuric acid and distilled the decoction with potash. The distillate, which was strongly alkaline and smelt like *conium*, was saturated with sulphuric acid, evaporated to dryness and exhausted with absolute alcohol. The solution, after evaporation of the alcohol, was treated with potash, and

and in the seeds, but in so small a proportion that we were unsuccessful in examination. It is the best solvent for its hydrochlorate, the aqueous solution of which was precipitated by most of the usual tests, but not by tannic acid.

"The colouring matter of capsicum fruits is sparingly soluble in alcohol, it is intensely red soft, it turns first blue, many other yellow colouring substances. By alcohol chiefly *palmitic* acid is extracted from

palmitic. Both this matter, as well as the distilled water, were neutral to litmus-paper and the water tasteless. We separated the latter and exposed the remaining greasy mass to a temperature of about 50°C, when it for the most part melted. The clear liquid on cooling solidified and now consisted of tufted crystals, which we further purified by recrystallization from alcohol. Thus about two centigrammes were obtained of a neutral white stearoptene having a decidedly aromatic, not very persistent taste, and by no means acid, but rather like that of essential oil of parsley. The crystals melted at 38°C. On keeping them for some days at the

be volatilized, and the part remaining behind acquired a brownish hue. This, no doubt, points out another impurity, as we ascertained by the following experiment. With boiling solution of potash, the stearoptene produces a kind of soap which on cooling yields a transparent jelly. If this is dissolved and diluted, it becomes turbid by addition of an acid. This probably depends upon the presence of a little fatty matter, a suggestion which is confirmed by the somewhat offensive smell given off by our stearoptene if it is heated in a glass tube.

"Bucshirum's 'Capsicol' is in our active principle, the *Capsaicin*, from the exhausting Cayenne pepper with petrol caustic lye removes *capsaicin*, which is to be precipitated in minute crystals by passing carbonic acid through the alkaline solution. They may

Cayenne Pepper or Chillies

CAPSICUM
frutescens.

CHEMISTRY.

be purified by recrystallizing them from either alcohol, ether, benzene, glacial acetic acid, or hot bisulphide of carbon, in petroleum *capsaicin* is but very sparingly soluble, yet dissolves abundantly on addition of fatty oil. The latter being present in the pericarp is the cause why *capsaicin* can be extracted by the above process.

"The crystals of *capsaicin* are colourless and answer to the formula $C_{18}H_{27}O_3$, they melt at $59^{\circ}C$, and begin to volatilize at $115^{\circ}C$, but decomposition can only be avoided by great care. The vapours of *capsaicin* are of the most dreadful acridity, and even the ordinary manipulation of that substance requires much precaution. *Capsaicin* is not a glucoside. It is a powerful rubefacient, and taken internally produces very violent burning in the stomach" (*Pharmacographia*).

Special Opinions.—§ "Stimulant and rubefacient, useful in dyspepsia, recommended in infusion as an external application to the eye" (*Pharmacopoeia of India*).

"Chiefly used as a con-
" (*Assistant Surgeon Anund*
malicious to a certain extent"
I, Bombay, Karachi) "Carmi-
with opium and fried *asafoetida*
gargle it is useful in stomatitis
what is called *masala* in the

" (*Surgeon, H M's 25th N L I,*
Bombay, Bhuj, Cutch) "The capsule is innocuous, the seeds, as well
known, are powerfully irritant" (*R T H, Morar*) "Chillies are applied
by natives to dog-bites. An infusion made with 4 drams of chillies and
a bottle of boiling water has been found useful in severe sore-throat"
(*Assistant Surgeon Bhagwan Dass, Rawal Pindi*). "In delirium tremens
in 20 grain doses" (*Surgeon-Major George Cumberland Ross, Delhi*).
"Is used in liniments as a rubefacient, in cholera pills with camphor and
asafoetida, as an application to elongated uvula and relaxed throat it is
very useful" (*A Surgeon*). "Active principle, an acrid oil-*capsaicin*.
In dyspepsia, a good pill is made with equal parts of *capsicum*, rhubarb,
and ginger" (*C M Russell, Civil Surgeon, Sirun, Bengal*). "Internally
it has a stimulant action on the bowels and helps to relieve constipation"
(*Surgeon-Major A S G Fayakar, Muskat*).

Food.—The fruit when green is used for pickling and when ripe is
mixed with tomatoes, &c, to make sauces. It is also dried and ground for
use like Cayenne pepper (*Treasury of Botany*).

FOOD
454

or daily
curries,
ginger,
oor can
ives the
maund

Capsicum, fastigiatum, Blume See *C minimum, Roxb*

C frutescens, Linn, Fl Br Ind, IV, 239

SPUR PEPPER, CAYENNE PEPPER, GOAT PEPPER, AND CHILLIES
THE SHRUBBY CAPSICUM

Ver

455

CAPSICUM
frutescens.

Cayenne Pepper or Chillies.

Isalamea china, VIT, *Menashind kavi*, KAN; *marichu phalam*, *brishu* or *bran maricha*, P SIVA; *Filfil-ahmar*, ARAB; *Fulfil* : *sarkh*, PRA; *Gas miri*, SINA

References.—Kath, *Fl Ind Fl CBC*, 103, Atchison, *Cat*, Pb Pl, 102, DC *Origin of Cult* 11, 20, Voigt, *Hort Sub Cal*, 510, U S *Dispens*, 15th Ed, 122; U C *Bot* Mat Med, Hind, 212 *Ainslie*, *Mat Ind*, I, 304 O Shaughnessy, *Beng Dispens*, 28, Biden Powell, *Pb Prod*, 321, Kayle, *Ill Illm Gt I*, 250; Atkinson, *Illm Dist*, 705, 720; Balfour, *Cyclop*; *Treasury of Botany*, Smith, *Dic*, 91, Simmonds, *Trop Agri*, 479

Habitat.—An annual, posed to have been recently, compared with America. According to the best of Capsicum, now cultivated in India, Indian cultivated species this is perhaps the commonest, as it is also the largest, being It is grown during the the country, and especially, when ripe, is generally dried out on mats to dry in

the sun

Opinions differ slightly as to the plants which afford Cayenne pepper. Speaking of this species, DeCandolle says "The great part of the so-called Cayenne pepper is made from it, but this name is given also to the product of other peppers. Roxburgh, the author who is most attentive to the origin of Indian plants, does not consider it to be wild in India" (*Orig Cult Pl*). Simmonds writes that "the Cayenne pepper of commerce is obtained chiefly from the pulverised chillies or fruit pods of one or two species of Capsicum (*C. annum*, Linn., and *C. fastigiatum*, Blume). So also in the *New Official Guide* (p 100) the dried and pulverised rind of the pods of *C. annum* and its allies is said to make the best Cayenne pepper.

Medicine.—Chillies are used as medicine in typhus and intermittent fevers and in dropsy, they are regarded as stomachic and rubefacient. In native practice they are prescribed in gout, dyspepsia, cholera, and ague (*Atkinson*).

Special Opinions.—"When taken in curry in unusual quantities, chillies cause, in many instances, great irritation and burning in the rectum, especially after defecation, attended also with scalding and frequent desire mustard, they form a powerful rubefacient." *Shub Chunder Bhattachary*, *Chanda*, ten grains of finely powdered capsicum

seed, given with an ounce of times shows wonderful effects

Gray, Lahore "Stimulant, a

and powder largely in the preparation of cholera mixture and pills, also in gurgles for sore-throat" (*Brigade Surgeon S M Shireore, Murshedabad*; "A powerful stimulant used as a gargle in sore throat, also in

"*Thornton Moughir*) used, although not in native curry

They are much used for flavouring pickles. By pouring hot vinegar upon the fruits all the essential qualities are procured, which cannot be effected by drying them, owing to their oleaginous properties, hence chilli vinegar is in repute as a flavouring substance. In Bengal the natives make an extract from the chillies which is about the consistence and colour of treacle. A form of soluble Cayenne was sent from British Gu-

C. 463

Cayenne
Pepper
456
Chillies
457

MEDICINE.
458

Seed.
459
Chillies
mixture
460

Chilli
Vinegar.
461
Chilli
Extract
462
Powder
463

Bell Pepper; Bird's-eye Chilli.

CAPSICUM
minimum.

ana in 1867 in the collection forwarded to the Paris Exhibition" (Simmonds, *Trop Agri.*, 480).

The pods are dried on a hot plate or in a slow oven and then pounded in a mortar. This powder is then passed through a handmill until it is brought to the finest possible state; thereafter it is well sifted and preserved in corked glass bottles for use (*Treasury of Botany*).

Capsicum grossum, Willd.; *Fl. Br. Ind.*, IV., 239.

BELL PEPPER.

Vern.—*Kafri mirich*, BENG, HIND.

References.—*Roxb.*, *Fl. Ind.*, Ed. C.B.C., 193; *Flück & Hanb.*, *Pharmacog.*, 452; *Dymock*, *Mat. Med. W. Ind.*, 2nd Ed. 640; *Birdwood*, *Bomb. Prods.*, 222; *DC Orig. Cult. Pl.*, 290; *Balfour*, *Cyclop.*; *Smith*, *Dic.*, 91; *Simmonds*, *Trop Agri.*, 479.

Habitat.—Not much cultivated in India, native place uncertain.

Food.—Cultivated to a limited extent in gardens, but chiefly for Europeans, who either cut this capsicum in stews or have it opened, stuffed with certain spices, and pickled in vinegar. The thick fleshy skin is not so hot as that of the other species.

C. minimum, *Roxb.*; *Fl. Br. Ind.*, IV., 239; *Wight*, *Is.*, I. 1617.

BIRD'S-EYE CHILLI.

Syn.—*C. FASTIGIATUM*, Blume; *C. BACCATUM*, Willd.

Vern.—*Gách marich*, HIND; *Dhan-Jung ka murich*, *lanká-morich*, *lál-morich*, BENG; *Lal mirich marchá*, GUJ.; *Mirchi*, *lal mirch*, DUK.; *Usimulaghal*, TAM.; *Sudmirapa kasa*, TEL.; *Chalie*, *loda-china*, MAL.; *Kappal melaka*, MALABAR; *Filfil surkh*, PERS.; *Filfil-ahmar*, (red-pepper), ARAB; *Miris*, SING.; *Nay-wa*, *gna yoke*, *gna yoke-no-pmyan*, *nayop*, BURM.

References.—*Roxb.*, *Fl. Ind.*, Ed. C.B.C., 193; *Voigt*, *Hort. Sub. Cal.*, 510; *Pharm. Ind.*, 180; *Flück & Hanb.*, *Pharmacog.*, 452, 453; *U.S. Dispens.*, 15th Ed., 349; *Bentl & Trim.*, *Med. Pl.*, I. 168; *U.C. Dutti*, *Mat. Med.*, HIND., 221; *Dymock*, *Mat. Med. W. Ind.*, 1st Ed., 531; *Waring*, *Basar. Med.*, 35; *Baden Powell*, *Pb. Prod.*, 363; *Spons. Encyclo.*, 1803; *Balfour*, *Cyclop.*; *Smith*, *Dic.*, 91; *Simmonds*, *Trop Agri.*, 479.

stimulant "
or crude inges
fever, it acts

repute in the West Indies. In various forms of cynanche, and in hoarseness or aphonia, depending upon a relaxed condition of the *chorda vocales*, it has been found a useful adjunct to gargles. As a rubefacient and counter-irritant, the bruised fruit, in the form of pulvise, acts energetically, added to sinapisms it greatly increases their activity. "Acts as an acid stimulant, and externally as a rubefacient used in

MEDICINE.
467

Carries.
468

C. 468

CARALLIA
integerrima

Small Chillies; Carallia

MEDICINEMixture.
469

putrid sore throat and scarlatina, also in ordinary sore-throat, hoarseness, dyspepsia, and yellow fever, and in diarrhoea occasionally, also in piles" (*Baden Powell*)

"In *Scarlatina*, the following mixture has attained much repute in the West Indies. Take two table-spoonsful of bruised Capsicum and two tea-spoonsful of Salt, beat them into a paste and add half a pint of boiling Water, when cold, strain and add half a pint of Vinegar. Dose for an adult 1 table-spoonful 3 or 4 times a day. Finished for children same formula forms *Waring, Bicar*

*Medicines*FOOD,
470

Food—This small "chilli" is rarely used by natives, but by Europeans is steeped in vinegar and mixed with salt, in this form it is employed as a seasoning in stews, chops, &c

CARAGANA, Lam, Gen Pl, I, 505

471

Caragana pygmaea, DC, Fl Br Ind., II, 116, Royle, III, t 34, fig 2, LEGUMINOSÆ

Vern—Tama dama, trāma, LADAK, Shmalak SINO

References—*Brandis For Fl* 134, *Stewart, Pb Pl*, 61, *Balfour, Cyclop.*

Habitat—A low shrub very much resembling furze. It inhabits the dry highlands of the Western Himalaya, altitude 8,000 to 17,000 feet

FOOD
Roots.
472
FODDER
473

Fodder—It is browsed by goats and is much valued for fuel in the treeless regions where it is met with. Balfour states that in China the roots of *Caragana flava* are eaten in times of scarcity

CARALLIA, Roxb, Gen Pl, I, 680

474

Carallia integerrima, DC, Fl Br Ind., II, 439, Wight, Ic, t 605, Beddome, Fl Sylva, t CXCLIII, RHIZOPHORÆ

Syo—C LUCIDA, Roxb, Fl Ind Ed C B C, 396 Kurr t, 451

Vern—Aierpa Bevo, Jar, KOL, Palamkat NEPAL, Kujilekra ASS, Punschi BOSH, Pansu phansi MAR, Karalli, Tel Andipunar, phansi, KAN, Damata darette, SING, Bya, ARRACAN, Manioga, mani-aw ga, BURM

References—*Brandis For Fl*, 219 *Gamble Man Timb* 177 XX *Thwaites En Ceylon Pl*, 120, *Dals & Gibs Bomb Fl* 96, *Voigt, Hort Sub Cal* 42, *Royle, III Him Bot*, I, 210, *Lisboe, U Pl*, *Bomb* 73, *Balfour Cyclop*

TIMBER
475

Structure of the Wood—Sapwood perishable heartwood red very hard, durable, works and polishes well, weight from 42 to 51 lb per cub c foot. In Cutch used for house building. In South Kanara employed for furniture and incense making and in Burma for planking, furniture, and rice-pounders. It is tough and not easily worked brittle and not durable, but has a pretty wavy appearance and is peculiar in structure (*Beddome*)

C. 475

The Monkey's Horn, Carapa

CARAPA
moluccensis.CARALLUMA, *R Br*, *Gen Pl*, II, 782

Fleshy, erect nearly leafless herbs with very thick subterete or angular stems. The generic *Carallum* is said to be derived from a South Indian vernacular name.

Caralluma adscendens, *Br*, *Fl Br Ind*, IV, 76, ASCLEPIADACEÆ 476

Vern — *Cullu mulayan*, TAM

References — *Murray, Pl and Drugs, Sind*, 162 *Balfour, Cyclop*

Habitat — Met with in arid places in the Dekkan Peninsula

Food — This fleshy plant is often eaten by the Natives in the form of pickles, or is made into chutney. FOOD 477

C. edulis, *Benth*, *Fl Br Ind*, IV, 76 478

Syn — *BOUCEROSIA EDULIS*, *Edge*

Vern — *Chung, chungu pippa pippa, pipa, sitán, sitlu suhi gandhal*, PB

References — *Stewart, Pb Pl*, 144 *Atchison, Cat*, Pb Pl, 90 *Murray, Pl and Drugs, Sind*, 162, *Baden Powell, Pb Pr*, 264, *Balfour, Cyclop*

FOOD
479

C. fimbriata, *Wall*; *Fl Br Ind*, IV, 77 480

MONKEY'S HORN

Vern — *Makar-sing*, BOMB

References — *Dale & Gibs, Bomb Fl*, 155 *Voigt, Hort Sub Cal*, 535, *Lusboa, U Pl*, Bomb, 165

Habitat. — Met with in arid rocky places of the Dekkan Peninsula, from the Konkan southwards, and also in the Ava district of Burma

Food — In the Bombay Presidency the plant is eaten as a vegetable. FOOD. 481

Carambola. See Averrhoa Carambola, *Linn*, GERANIACEÆCARAPA, *Aubl*, *Gen Pl*, 338**Carapa moluccensis, *Lam*, *Fl Br Ind*, I, 567, *Bedd*, *Fl Sylv*, I 136, MELIACEÆ** 482

Syn — *C. OBOVATA*, *Bl (Kurz, s, 225) XYLOCARPUS GRANATUM*, *Kam*

Vern — *Poshur, pussur*, BENG *Kandalanga*, TAM, *Pinlayoung, pini on peng-lay-oang* BURM, *Kadot SING*

References — *Roxb Fl Ind*, Ed CBC 310 *Gamble, Man Timb* 74, *Kurz For Fl Burm* 226 *Thwaites Fn Ceylon Pl* 61 *Pharm Ind*, 56 *Moodeen Sheriff Sipp Pharm Ind*, 260, *Cooke, Oils and Oilseeds*, 10

Habitat — A moderate-sized evergreen tree of the coasts of Bengal, Malabar, Burma and Ceylon

Gum. — It yields a clear, brown, brittle resin

Oil — The seeds yield, on expression, a whitish semi solid fat. This remains fluid only at high temperatures. It is used as a hair-oil, and also for burning purposes.

GUM
483
OIL
484

CARBONATE OF LIME

Carbon; Indian Lime.

MEDICINE
Bark,
485TIMBER
486

Medicine — "The bark, in common with other parts of the tree, possesses extreme bitterness, conjoined with astringency, it may probably prove a good astringent tonic. It is much employed by the Malays in cholera, colic, diarrhoea, and other abdominal affections" (*Pharm Ind*)

Structure of the Wood — White, turning red on exposure, hard. Weight about 45 to 50 lb per cubic foot.

Used in Burma for house posts, handles of tools, and wheel spokes. Captain Baker, in May 1829, in *Gleanings in Science*, spoke of Pussuf or Pussuah as being a jungle wood of a deep purple colour, extremely brittle and liable to warp. He said that native boats made of the best species last about three years, and that the wood, if of good quality, stands brackish water better than *sal*.

Caraway. See *Carum Carui*, Linn., UMBELLIFERÆ

487

CARBON.

Carbon.

Vern — *Khyelah*, HIND; *Khyalā*, BENG; *Tsing*, tsuna KASHMIR; *Salah*, BSOTE; *Aklaté*, MAR; *Kōsō*, Kōsō, GUJ; *Kōisa*, DUK; *Kari*, TAM; *Boggu*, TEL; *Kari*, MAL; *Iddailu*, KAN; *Angutaha*, SANS; *Zughol*, PERS; *Fahm*, or *Faham*, ARAB; *Angurn*, SIN; *Miswe*, midwe, BURN.

References — *Pharm Ind*, 289; *Moodien Sheriff Supp Pharm Ind*, 87; *U S Dispens*, 15th Ed., 351; *Baden Powell*, Pb Prod., 608 p., Ure, *Dict of Arts and Manufactures*, 720.

MEDICINE,
488

Medicine — Wood charcoal is antiseptic, deodorizing, and disinfectant. It has been employed successfully in dyspepsia, diarrhoea, dysentery, and intermittent fevers. It is also used as a demulcent. Animal charcoal is deodorizing and antiseptic. It has been employed as an antidote in poisoning cases and as a poultice to foul swellings and ulcers.

Special Opinions — 6 "In place of animal charcoal, wood charcoal has been largely used in hospitals as a disinfectant. It purifies water and may be used in filters for that purpose" (*Assistant Surgeon Shih Chunder Bhattacharya*, Chanda, Central Provinces). "The charcoal of Areca nut is a good tooth-powder" (*V Ummegudien*, Mettapolinam, Madras). "Fine powder, with syrup or treacle, useful in sloughing dysentery" (*Surgeon-Major O J McKenna*, Cawnpore). "Animal charcoal is a blood purifier, and as such is of great value in boils" (*Surgeon-Major A S G Jayakar*, Unskit, Arabia). "Wood charcoal mixed with oil is used by carpenters as an external application for wounds" (*Assistant Surgeon Bhagwan Dass*, Civil Hospital, Rawal Pindi, Panjab). "Used to stop bleeding from wounds" (*Honorary Surgeon P Kinsley*, Chicole, Ganjam District, Madras Presidency).

For further information see Charcoal.

489

CARBONATE OF LIME

Carbonate of Lime.

CARBONATE OF LIME, MARBLE, LimestONE, CHALK, and LIMES.

Vern — LIME — *Chund chunah*, *chunnah*, HIND; *Chun*, *chund*, BENG; *Chunah*, *shak*, (quckime) *kalas* (slaked) PS; *Chun*, GUJ; *Chund*, KAN; *chuna*, MAR; *Chunah*, *chunnah*, DUK; *Chundab*, *chundabon*, TAM; *Sunnah*, *sanna*, TEL; *Capur*, *nyra*, MALAY; *Sunn*, KAN.

C. 489

Indian Lime.

CARBONATE OF LIME.

*Sudhā, chāra, sankha-bhasm, kapardaka-bhasma, sukta-bhasma, sam-
buka-bhasma, SAND; Kals, ahū, ARAB; Nārah, dhak, PERS; Hānnū,
hunu, SING; Thōn-thiun, BURM; Kapor, MALAY.*

*CHALK.—Kharī-mull, HIND, PN; Kharī mēti, BENO.; Vildyati-
chūna, MAR.; Chak, vilati-chund, GUJ; Vildyati-chund, DUK.; Shi-
raa, shonndmbu, TAM; Shims sunnum, TEL.; Shimanura, MALAY;
Shima-sund, KAN.; Kalauchunu, SING; Mier-phiau or me-biyu, thom-
bin, BURM.*

*UNSLAKED LIME.—Kali kī-chūna, HIND; Kar-shunnambu, TAM;
Kalla sunnumu, TEL.*

References.—Page, Hand-book of Geology, &c.; Dana, Manual of

The Minerals of India having been treated in considerable detail in Mr. Ball's "Economic Geology" and in the other voluminous publications of the Geological Survey, it is not intended to do more in this work than to indicate briefly the minerals of commercial value. Limestone, Lime, and Marble are, however, of such importance as to justify an account being given, the more so since the literature of these substances is scattered and not readily obtainable. Lime is also intimately associated with many industries, and plays a distinct part in the manufactures which fall fairly within the scope of the present work. It has therefore been thought desirable to give a brief abstract of the available information regarding Lime, Limestone, and Marble. See MARBLE.

Marble.

producing the colouring and veining, and from the presence of imbedded shells, corals, or other organisms (See Marble).

Limestone.

Chalk.

addition of ammonia water.

CARBONATE OF LIME.

Carbon; Indian Lime.

MEDICINE.

Bark,
485

TIMBER.

486

Structure of the Wood.—White, turning red on exposure, hard. Weight about 45 to 50 lb per cubic foot. Used in Burma for house posts, handles of tools, and wheel-spokes. Captain Baker, in May 1829, in *Gleanings in Science*, spoke of *Pussiah* or *Pussiah* as being a jungle wood of a deep purple colour, extremely brittle and liable to warp. He said that native boats made of the best species last about three years, and that the wood, if of good quality, stands brackish water better than *sal*.

Caraway. See *Carum Carui*, Linn.; UNBELLIFERE.

487

CARBON.

Carbon.

Vern.—*Kôyelah*, HIND; *Kôyôl*, BENG.; *Tsing*, TSUNA, KASHMIR; *Sal-lah*, BHOTE; *Kôlas*, MAR; *Kôlo*, KÔLO, GUJ; *Adis*, DUK; *Kari*, TAM; *Boggu*, TEL; *Kari*, MAL; *Idallu*, KAN; *Angdaha*, SAK; *Zughel*, PERS; *Fahm*, or *Faham*, ARAB; *Angura*, SIND; *Miswe*, *misunge*, BURM.

Reference
87 U S
Dict. of

Ind,
Ure,

MEDICINE.

488

Medicine.—Wood charcoal is antiseptic, deodorizing, and disinfectant. It has been employed successfully in dyspepsia, diarrhoea, dysentery, and intermittent fevers. It is also used as a dentifrice. Animal charcoal is deo-

ing.
been largely
be used in
Bhattachar

It purifies water and may
nt Surgeon Shih Chunder
The charcoal of Areca nut
is a good tooth-powder (v. *Ummegueren*, *Metapollum*, *Madras*).
"Fine powder, with syrup or treacle, useful in sloughing dysentery."
(Surgeon-Major C. J. McKenna, *Cawnpore*). "Animal charcoal is a
blood-purifier, and as such is of great value in boils" (Surgeon-Major
A. S. G. *Fayakar*, *Muskat*, *Arabia*). "Wood charcoal mixed with oil is
used by carpenters as an external application for wounds" (Assistant
Surgeon Bhagnan Dass, *Civil Hospital*, *Rawal Pindi*, *Panjab*). "Used
to stop bleeding from wounds" (Honorary Surgeon P. Kinsley, *Chica-*
cole, *Ganjam District*, *Madras Presidency*)

For further information see Charcoal.

489

CARBONATE OF LIME.

Carbonate of Lime.

CARBONATE OF LIME, MARBLE, LIMESTONE, CHALK, and
LIME.

Veto —LIME—*Chuna*, *chunah*, *chunnah*, HIND; *Chun*, *chûn*, BENG; *Chûnah*, *dhak*, (quicklime) *halai* (slaked) PB; *Chino*, GUJ; *Chânâ*, *kali chûna*, MAR; *Chunak*, *chunnah*, DUK; *Chunâmbû*, *shunnâmbû*, TAM; *Sunnam*, *sunna*, TEL.; *Capur*, *nîra*, MALYAL; *Sunna*, KAN;

C. 489

Indian Lime.

CARBONATE OF LIME.

Sudhā, chūrna, sankha bhasm, kopardaka bhasma, sukṭi-bhasma, sam buka-bhasma, SANS, *Aṣṭ, aṣṭ, KRAB, Narah, ahak*, PERS, *Hānnu, hunu*, SING, *Thōu-phiyu, BURM, Kapor*, MALAY.

PB

CHALK — *Khari-mitti*, HIND, PB, *Khari mati*, BENG; *Vilāyati-chuna*, MAR, *Chak, vilati-chunā*, GUJ, *Vilayati-chunna*, DUK, *Shi-maa, shannambu*, TAM, *Shima sunnum*, TEL, *Shimanura*, MALAY, *Shima-sunnd*, KAN, *Rataukunu*, SING, *Mie phéau or me-di-yu, thom-biyu*, BURM

UNSLAKED LIME — *Kali ká chuna*, HIND, *Kar shunnamdu*, TAM, *Ralla sunnumu*, TEL

References — *Page, Hand-book of Geology, &c.; Dana, Manual of Mineralogy, 2d ed., 1862; Ball, Geology of India, 1862; Miller, Chem.*

The Minerals of India having been treated in considerable detail in Mr. Ball's "Economic Geology" and in the other voluminous publications of the Geological Survey, it is not intended to do more in this work than to indicate briefly the minerals of commercial value. Limestone, Lime, and Marble are, however, of such importance as to justify an account being given, the more so since the literature of these substances is scattered and not readily obtainable. Lime is also intimately associated with many industries, and plays a distinct part in the manufactures which fall fairly within the scope of the present work. It has therefore been thought desirable to give a brief abstract of the available information regarding Lime, Limestone, and Marble. See MARBLE

Marble.

producing the colouring and veining, and from the presence of imbedded shells, corals, or other organisms (See Marble).

If The quality or richness of a LIMESTONE is generally perceptible to the eye, but when this is not the case, it may be detected by the violence of the effervescence produced on the application of a little sulphuric or muriatic acid, or by heating a fragment before the blow-pipe so as to convert it into quicklime

Limestone.

Chalk.

CARBONATE OF LIME.

Indian Lime

Lime.

IV. LIME is an oxide of the metal Calcium. It is known as quicklime before being slaked with water, the expression "quicklime" is in allusion to its corrosive property. It is literally Calcic Oxide (CaO) or CARBONATE OF LIME deprived of its carbonic acid. On being slaked it is converted into CALCIC HYDRATE (CaH_2O_2) which on being mixed with sand forms mortar or cement. "As an earth, lime is properly disseminated in nature, as a rock, it enters largely into the composition of the earth's crust, it is less or more diffused in all its waters, it forms the principal ingredient (earth of bone) in the skeletons of the larger animals, and is secreted by many classes of the invertebrate to form their shells, crusts, shields, corals, and other means of protection. Economically it is also of vast importance, being used in the manufacture of mortars and cements, in tanning, bleaching, deodorising, and the like, and also in agriculture as a fertiliser or promoter of vegetable decays" (Page)

FORMS OF LIME USED IN INDIA

There are three kinds of lime used in India: (a) lime prepared from limestone, (b) lime found on the surface of the ground and known as *kankar*, and (c) lime prepared from fresh-water or marine shells.

(a) LIME FROM LIMESTONE

LIMESTONE.
490

Speaking of the distribution of limestone and marble, Mr Ball in his "Economic Geology" says "Limestones can hardly be said to be absent from any of the formations in India, though in some they are either rare or so impure as hardly to deserve the title. In the metamorphic series, bands of crystalline limestones occur locally in some abundance, but they are capriciously distributed, being often absent over large areas. In some of the groups of the next succeeding or transition series, namely, in the Kadirah, Bijáwar, and Arvali, the limestones attain a considerable development, and some of the varieties have yielded the marbles which have played such an important part in Indian architecture. In the lower Vindhyan series the limestones are more notable for their abundance, and the wide areas over which they spread, than for producing any marbles of particular beauty. In the upper Vindhyan, limestones are principally found in the Bhaner group, where they sometimes attain as great a thickness as 260 feet, and are used both as a building stone and for lime.

"In the Gondwana series, limestones are rarely met with, and then chiefly in the Talchur and Raniganj groups, where they occur as lenticular or concretionary masses.

"In the rocks of cretaceous age, within the peninsula, limestones of both sedimentary and coral reef origin occur. The other sources of lime are principally sub recent and recent tufaceous deposits of *kankar*, travertine, &c.

"In the extra peninsular regions the principal formations containing limestones are of carboniferous, jurassic cretaceous, and nummulitic ages. Another source of lime is recent coral. On the whole it may be said that although lime is a dear commodity at most of the centres of consumption owing to the cost of carriage, possible sources of lime occur in the greatest variety throughout the country while on the other hand, some of the marbles are probably unsurpassed for beauty by any to be obtained in any other part of the world.

Mr Ball further gives in the succeeding 16 pages of his work, a detailed account of the limestones and marbles, arranged according to provinces. The following abstract may be found useful—

In Madras, good limestones and marbles occur at Trichinopoly, Coimbatore, Kadappa, Karnul, and Guntur. These, since the opening

C. 491

Indian Lime.

CARBONATE OF LIME.

... kinkar formerly employed for	LIMESTONE
supplies and Loh	492
peculiar interest because of their proximity to iron ore.	
In the Central Provinces, limestones occur at Simbalpur, Raipur, and Jabalpur, the latter consisting of the famous marble rocks of that name. Limestones also occur throughout the Vindhya range, the most accessible being in the neighbourhood of Warora. At Raipur a stone	493
	494
	495
well as in Northern Afghanistan. In the latter the Safed Sang takes its name from a beautiful Statuary marble	
In the Punjab, marbles and limestones in considerable variety and from different geological formations are met with	496
In the North-West Provinces and along the Tarai to Darjiling, limestones are not infrequent. An account of these may be found in Atkinson's <i>Economic</i> ... r. Mallet on the Geology ... Speaking of the lime ... s Himd-layan Districts, ... Tal, at Jyuli in the Kharahi range, half way between Bageswar and Almora, at Chitli, north of Dwarahat, at Simalkha, Baitalghat, and Dhikuli for Ranikhet, and on the new cart road to Ramnagar. Lime is also made in Borarau, Sor, Sira, Dhyaniroo, and Charai. Two kinds of limestone are used in the Tarai ... from the ... at the foot of the other this latter	497
stone costs at the quarries Rs 5 to Rs 8 per 100 maunds, the tax levied by the Forest Department is Rs 8 on that amount, and cartage may be averaged at half a rupee per mile for a 100 maunds. Thus the stone is landed at most points in the district for Rs 30 per 100 maunds, and including the expense of burning, a maund of lime costs 10 to 12 annas. This lime will bear two or three portions of pounded brick or <i>sirki</i> . Second-class lime ready for use now costs Rs 25, and delivered in Naini Tal Rs 50 to Rs 100 per 100 maunds, it will, however, only bear a proportion of one part of pounded brick to two parts of lime.	
In Central India, at Gwalior an abundant supply of flaggy limestones occurs.	498
In Rajputana, the Arvali group of transition rocks includes many varieties of marble, some of them being of great beauty. The Jhri quarries of Alwar afford hard white marble. Black marble is met with at Mandla, near Ramghur, white as well as pink and grey marbles at Raialo in Taipur. But the most extensive marble quarries of Rajputana are at Makrana in Jodhpur. This marble has been celebrated for ages, the Taj of Agra being built of it.	499
In Bombay, there are numerous localities where limestone occurs, but no marble. In the Panch Mehals, good building limestones are obtained, but not hydraulic, and in Guzerat more or less calcareous rocks are met with.	500

CARBONATE OF LIME

Indian Lime

LIMESTONE

501

In Assam, in the Brahmaputra Valley, nummulitic limestones occur at several localities, the southern face of the Khasia and Jaintia Hills affording an inexhaustible source of supply, known in trade as Sylhet lime

502

In Burma, nummulitic limestones occur in Arracan and Pegu, and in Tenasserim true carboniferous limestones are met with. In Upper Burma a beautiful white semi-transparent marble, extensively used for carving figures of *Gondama*, is said to be obtained from the hills in the Madeya district.

503

In the Andaman Islands, an important supply of lime, for Calcutta, is afforded by the coral reefs

The writer has been favoured, by Mr. H. B. Medlicott, with the following brief account of the important

Lime is a scarce article in many parts used in Calcutta is carried many hours

The want of a pure limestone flux at moderate cost has been the chief difficulty in working the iron furnaces in the Raniganj coal-field. The most general source of building lime in India is *kankar* or *kunkur* (meaning gravel), a granular or nodular stone found on the surface and in the sub-soil. It is purely of secondary origin being formed on the

taining in solution more process of soil formation

The production of it is of soaking moisture most pronounced, as coalesce into a con- so formed must of of foreign matter

very
and
in N
tinuo
course
of

sh
he
rules high the

504

excellent quality,
and forms a large

proportion of the lime used in that city

505

"*and, Sylhet*—Along the southern foot of the Sylhet hills there is an extensive limestone of the nummulitic series, of the demand of Calcutta and lower extent.

506

Vindhyan limestone near Rhotasgarh is ported down the Son in boats, it was Son Canal

507

lime

508

Port Blair which may prove of economic importance, as it is at about the same distance from Calcutta as Katm, and the lime is of equally good quality

"Other localities where limestone is known are numerous, but at present of merely local importance, or in most cases of no value whatever. A full list of them, as far as they are known, will be found in the *Manual of the Geology of India*, Vol III, p 449, et seq"

C. 508

Indian Lime

CARBONATE OF LIME.

(b) KANKAR OR CONCRETIONARY LIME.

KANKAR.
509

KANKAR (KUNKUR).—"Throughout the plains of Upper India the principal source of lime is the *kankar* which is found in nodules and layers of various sizes in the clays of the Gangetic alluvium. It yields an excellent but somewhat hydraulic lime" (*H. B. Medlicott. See also the remarks under Limestone.*)

"By Anglo-Indians the term '*kankar*' (which really means any kind of gravel) has been specially used for concretionary carbonate of lime, usually occurring in nodules, in the alluvial deposits of the country, and especially in the older of these formations. The commonest form consists of small nodules of irregular shape, from half an inch to 3 or 4 inches in diameter, and composed within of tolerably compact carbonate of lime, and externally of a mixture of carbonate of lime and clay. The more massive forms are a variety of calcareous tufa, which sometimes forms thick beds in the alluvium, and frequently fills cracks in the alluvial deposits or in older rocks.

"In the beds of streams immense masses of calcareous tufa are often found, forming the matrix of a conglomerate, of which the pebbles are derived from the rocks brought down by the stream. There can be no

"As a flux for iron, *kankar* has been tried on several occasions, and

510

something less

"Block *kankar* has been largely employed as a building stone, more particularly in connection with the Ganges Canal Works" (*Ball*)

Most of the roads in Northern India, and indeed in India generally, are metalled with *kankar*.

(c) SHELL-LIME

SHELL-LIME.
511

SHELLS.—Ainslie, in his *Matéria Indica*, mentions lime produced by

considered more valuable for building purposes than that obtained from limestone, and fetches a higher price" (*T. N. Mukharji, Amsterd Cat*)
was employed

1 to the Agri-
cultural Medical
coast of China

CARBONATE OF LIME.

Indian Lime.

SHELL-LIME.

that I have visited by burning the shells of the genus *OSTREA*, which
 are in

are
 globosa.

AGRICUL-
 TURAL USES.
 512

LIME ESSENTIAL TO VEGETATION.

Lime is invariably present in the ash of all agricultural plants. It is, however, difficult to decide from this fact alone, whether it is indispensable to vegetable life, since the substances found in ash are universal distributed over the earth's surface and are invariably present in all soil. Several experiments have been made by scientific men under various circumstances to establish fully the above facts, with results to a certain extent satisfactory. For further information on this subject the reader is referred to Johnson's *How Crops Grow*, pp. 166-172.

INDUSTRIAL PURPOSES.

INDUSTRIAL
 USES.

Dye — Lime is universally used by the Manipuris to assist in the

Dye adjunct
 513

employed in the Rajshahye district for dyeing thread dark blue; of this Dr. McCann gives the following account: "The thread is first washed with *sajji matt* and dried. It is then dipped in a solution of *patta sajji matt*, 4 *chittas* of cold water, are mixed together and the thread is dipped in it from the deposit the whole is then put in a solution of *chittas* lime and

chittas of *aooshi* wood are again added to this solution. The thread is then twice dipped in this so

Calico
 printing.
 514

preparation of blue printing ink of permanent colour. A mixture of 4lb of shell-lime, 10lb of stone-lime and 15lb of impure carbonate of soda (*reh*), with 3 gallons of water, is strained through grass; to this is added 1lb of sulphurate of arsenic and 1lb of indigo; the mixture is then boiled "till it assumes the metallic greenish-blue lustre of the peacock's tail. It is then thickened with *babul* gum and is then ready for printing." Sir Edward further remarks: "Lime is used in calico-printing, in combination with gum, as a 'resist-paste' It is also employed with gum and converted into 'indigo-white'."

A paint.
 515

Carbonate of lime is used as a

Tanning
 516

hides for the removal of the hair. In England it is universally used for this purpose. It has at the same time a solvent action on the hide "The hardened cells of the epidermis swell up and soften the *rete malpighi*, so that, on scraping with a knife, the hair is completely removed." (*Spons*)

Indian Lime.

CARBONATE OF LIME.

MEDICINAL USES.

Medicine—According to Dutt, in the *Hindu Materia Medica* (p. 82) lime is used internally in dyspepsia, enlarged spleen, and other enlargements in the abdomen, and externally as a caustic. A mixture of lime,

MEDICINE.
517

rasa.

Almslie says the Vytians prescribe lime water mixed with gingelly oil and sugar in obstinate cases of gonorrhœa. "Mixed with gamboge, quicklime is applied externally to painful and gouty limbs. It is also used as a caustic in the bites of rabid dogs" (*S Arjun, Bomb. Drugs*). The exhaustive account of the medicinal properties of lime given by Dr. Waring in his *Bazar Medicines* (p. 85) may be here quoted, since by doing so it will practically be unnecessary to refer to other authors—

518

"Lime water is prepared by adding 1 ounce of lime to 1 pint of water. The lime is deposited at the bottom. In cases of emergency, as burns, &c., half an hour is sufficient for this purpose, otherwise it should be allowed to stand for twelve hours at least before being used. It is only the clear water which holds a portion of lime in solution, which is employed in medicine. It is advisable always to keep a supply ready prepared, as it is useful in many ways, and it will remain good for a long time, if kept in well-stoppered bottles, so that the air cannot have access to it. The dose for adults is 1 to 3 ounces twice or thrice daily, it is best administered in milk.

519

adap
parec
and t
water.
The
or thrice daily

"In acidity of the stomach, in heart-burn, and in those forms of indigestion arising from or connected with acidity of the stomach, lime water in doses of 1½ to 2 ounces, is often speedily and permanently effectual. It is particularly useful in indigestion when the urine is scanty and high coloured, and when vomiting and acid eructations are prominent symptoms. It is best given in milk.

"In diarrhœa arising from acidity, lime water frequently proves useful, it is best given in a solution of gum arabic or other mucilage, and in obstinate cases 10 drops of laudanum with each dose increase its efficacy, it may also be advantageously combined with Opium water. In chronic dysentery the same treatment sometimes proves useful. Enemas of lime-water diluted with an equal part of tepid milk or mucilage have also been used with benefit. It is especially adapted for the diarrhœa and vomiting of infants and young children which result from artificial feeding, in these cases a sixth or a fourth part of lime water may be added to each pint of milk. The saccharated solution of lime has also been found of great service in this class of cases.

"Obstinate vomiting sometimes yields to a few doses of lime water in milk, when other more powerful remedies have failed. It is worthy of a trial in the vomiting attendant on the advanced stages of fever; it has

C. 519

CARBONATE OF LIME.

In Its Uses.

MEDICINE.

been thought to arrest even the black vomit of yellow fever. It is also a remedy of much value in prostatic water-drops.

"For local diseases no sensation of the great vessels (Pons) is produced, bathing the parts with the lime water three or four times a day sometimes affords relief. For ulcers and other vaginal discharges have in some instances been treated and even cured by the use of vaginal injections of a mixture of 1 part of lime water and 2 or 3 of water.

520

"In scrofula, lime water is given of 1 ounce in milk, three or four times a day, proves beneficial in some cases; it is thought to be especially adapted for those cases in which abscesses and ulcers are continually forming. To be of service, it requires to be persisted in for some time. Scrofula is not often affected by much discharge have been found to improve under the use of lime water as a local application. For syphilis ulcers or chancres, one of the best applications is a mixture of lime water 1 pint and calomel 30 grains; this, commonly known as black wash, should be kept constantly applied to the part by means of a piece of lint or rag moistened with it. Many forms of skin disease, attended with much secretion and with great irritation or burning, are benefited by lime water either pure or combined with oil. To cure orers of the nose, it forms a useful injection in discharges from the nose and ears occurring in scrofulous and other children.

"In Consumption, lime water and milk has been strongly recommended as an ordinary beverage. The same diet-drink has been advised in Diabetes, but little dependence is to be placed upon it as a cure, it may produce temporary benefit.

"In Thread-worm, enemata of 3 or 4 ounces of lime water, repeated two or three times, have sometimes been found sufficient to effect a cure.

"In Poisoning by any of the Mineral Acids, lime water given plentifully in milk is an antidote of no mean value, though inferior to some of the other alkalis. It may also be given in Poisoning by Arsenic.

521

"To Burns and Scalds few applications are superior to Lime Liment, composed of equal parts of lime water and a blend of Olive oil. It is generally ordered for this purpose, but linseed oil answers just as well, and where this is not at hand Sesamum oil forms a perfect substitute. When thoroughly shaken together, so as to form a uniform mixture, it should be applied freely over the whole of the burnt surface, and the parts kept covered with rags constantly wetted with it, for some days if need arise. This limment on cotton-wool, applied to the pustules, is said to be effectual in preventing Pitting in Small pox."

LIME AS A CONDIMENT

FOOD
in pan,
522

Food.—Lime forms one of the essential ingredients of the preparation known as *pán* which is universally chewed by the natives of India. Either the lime prepared from limestone or from shells may be used for this purpose. The latter, however, being an animal product, is not used by persons who are strict in their religious observances. It is also mixed with the pulp of the fruit of *Borassus flabelliformis*, in preparing the cake called *talpatals* (see the remarks under B 501). The *Pharmacopæia* of India, alluding to the use of lime in *pán*, says, "when used for any lengthened period, it considerably modifies the natural condition of the mucous covering of the mouth, and alters the appearance of the tongue so as to render it useless or fallacious as a means of diagnosis in disease. Its use in moderate quantities does not appear to act prejudicially on the system, but when largely indulged in, it lays the foundation of much visceral disease."

523

Indian Lime

CARBONATE OF LIME.

DOMESTIC AND OTHER USES.

Manure—As a manure, lime plays an important part. It is largely employed for this purpose, and is "particularly valuable upon very rich vegetable soils, such as those formed over peat bogs, its effects in these cases are partially due to the decomposition of the organic matter, which it renders soluble and capable of assimilation, while the lime itself is converted into carbonate" (*Miller's Chemistry, Part II, 466*). The black cotton soils are usually rich in most of the elements of plant food except lime. Lime therefore "acts beneficially on the soil itself. Owing to the general absence of lime in these black soils the crops produced on them are not so diversified as is desirable. A dressing from 1,000 to 5,000 lb of lime may be applied per acre, according to the price at which the lime can be obtained" (*W. R. Robertson, Agriculture, 13*).

Lime is often employed as a deodorising agent. "It is mixed with decaying vegetable matter, and with animal bodies, with the view of hastening their destruction and preventing the escape of offensive and noxious effluvia. This effect lime produces by its tendency, in common with the other caustic alkalies, to carry the decomposition through the intermediate stages of putrefaction at once to the ultimate products" (*Morton, Cyclop., Agriculture, Vol. II, 266*).

Soap—Lime is which is described this soap, into which slaked lime equal to whole is to be boiled solution of glycerine are produced, when the latter may be drawn off from the bottom of the pan. A certain quantity of water and commercial carbonate of soda (the latter being slightly in excess of the quantity of lime used) are next added and the boiling and stirring continued, when the hard insoluble lime soap will be decomposed, and a 'granulated' carbonate of lime will deposit, leaving a soluble soda soap floating in flakes on the surface of the liquid. If the soda employed does not contain

DOMESTIC.
Manure
524

Soap,
525

Mortar and Cement—The use of lime in the preparation of mortars and cements is too well known to require any special description. The following paragraph from *Miller's Chemistry, Part II, 462*, is, however, quoted here, as it will be found instructive. "The great consumption of lime in the arts is for the purpose of making mortars and cements. Pure lime, when made into a paste with water, forms a somewhat plastic mass which sets into a solid as it dries, but gradually cracks and falls to pieces. It does not possess sufficient cohesion to be used alone as a mortar, to remedy this defect and to prevent the shrinking of the mass, the addition of sand is found to be necessary. Ordinary mortar is prepared by mixing one part of lime into a thin paste with water, and adding 3 or 4 parts of sharp sand of tolerable fineness, the materials are then thoroughly incorporated, and passed through a sieve to separate lumps of imperfectly burnt lime, a suitable quantity of water is afterwards worked into it, and it is then applied in a thin layer to the surfaces of the stones and bricks which are to be united. The bricks or stones are moistened with water before applying the mortar, in order that they may not absorb the water from the mortar too rapidly. The completeness of the subsequent hardening of the mortar depends mainly upon the thorough intermixture of the lime and sand."

Cement.
526

Indian Manufacture of

CARBONATE OF POTASH.

clarified and the crystallizable sugar extracted, the remaining liquor is permitted to ferment, that the uncrystallizable sugar may be turned into alcohol and so utilized; but in the stills there will yet remain a waste

By evaporat-
aporating and
of a mixture of

potassium chloride, sulphate, and carbonate (together 50 or 60 per cent) with insoluble matter and a good deal of sodium carbonate. The potassium carbonate forms about one-third of the weight of the calcined mass, and arises in a great measure from the destruction, during the calcining

SOURCES OF

duced here because of its direct bearing on many of the native contrivances employed in India for the preparation of pearlash. It would be almost impossible to over-estimate the extent to which a crude carbonate of potash is employed by the people of India. In another volume under Alkaline Ashes (A 759, also A 1020) will be found an enumeration of the principal plants used by the natives of India for that purpose, and these should be compared with the plants given under Berilla (B. 163) as employed in the manufacture of carbonate of soda. Although in India immense tracts of mountainous land are injuriously covered with various species of wormwood (see *Artemisia*), except as a manure, the ashes of these plants are not apparently utilized. From the high percentage of carbonate of potash which the wormwoods contain, the preparation of pearlash might be confidently recommended to the poorer inhabitants of these regions as a useful new industry. A large export trade might reasonably be anticipated from the Himalayas to the plains of India, if not to foreign countries.

Wormwood
Ash,
530

While this is possible, an equally profitable industry might also be organised in preparing the carbonate from the injurious amount of saltpetre that impregnates the soil of many parts of India. One of the methods recommended for obtaining pure carbonate of soda for the laboratory is to heat pure saltpetre in a porcelain or earthen crucible, adding small pieces of charcoal till deflagration ceases. This is the *rationale* of a process that might readily be employed in converting crude saltpetre into carbonate of potash. As a commercial fact, large quantities of carbonate are now manufactured from the sulphate, indeed after the ashes of plants, this is the next most important source of the carbonate. A curious and recent source is the Suint or perspiration on the wool of sheep.

The
Carbonate
from
Saltpetre.
531
from the
Sulphate
532
From Suint.
533

Uses of Carbonate of Potash.—It is largely employed in the manufac-

Soft Soap.
534

medicine and for other purposes" (*Balfour*).

Manufacture in India.—Although, as already stated the ashes of plants are universally used, both in dyeing and in medicine, throughout India, every district or almost each artisan holding special merits as possessed by the ashes of this and that plant, still there are no large recognised centres where the carbonate (which alone must be held as the active principle in these ashes) is prepared for transport, still less export. The suggestion made above as to a possible Indian manufacture from worm-

Dyeing.
537
Rectification
of Spirit
538
Bleaching.
539

CARBUNCLE.

Carbonate of Soda: Carbuncle.

CARBONATE
of POTASH.

wood on the hills and from saltpetre on the plains seems, therefore, worthy of consideration.

Yearly Production.—The world's annual production is about one million hundredweights.

MEDICINE.
540

Medicine.—Carbonate of potash is antacid, then alterative and diuretic, and in over-doses poisonous. It is described in Hindú works on medicine "as stomachic, laxative, diuretic. It is used in urinary diseases, dyspepsia, enlarged spleen, and other enlargements of the abdominal viscera. A decoction of chebulic myrobalan and *rohitaka* bark is given, with the addition of carbonate of potash and long pepper, in enlarged spleen. In strangury very

Special Opinions—§ "An impure carbonate of potash (*papūna khara*) is also sold in the Bombay bazárs, and is used in the preparation of *pápāda* (*pāpun*), or little cakes made with the meal of the different sorts of *dhall* and a little quantity of asafoetida; these are given as a digestive, but more as an article of food than medicine; the cakes are roasted over the fire and taken with rice" (C. T. Peters, M.B., *Zandera*, South Afghanistan).

For further information see ALKALINE EARTHS, BARILLA, POTASH, REH and SALTPETRE.

541

Carbonate of Soda.

Vern.—*Sajji*, *sajji-mutti*, *sajji-khar*, HIND; *Sajji*, BENG, *Chour-ki-matti*, *chour-ká-namak*, DUK, *Sajjekhara*, MAR; *Shach-cho-karam*, TAN; *Lolo-sach-cho*, TEL; *Qili*, *milhul-qili*, ARAB; *Shikhar*, *ting-dsur*, PERS; *Sarjikhakshara*, SANS

References.—*Pharm. Ind.*, 322; *S. Arjun*, *Bomb. Drugs*, 160, 161; *U. S. Dispens.*, 1321; *Ure*, *Dict. of Arts and Manufactures*, 854.

MEDICINE.
542

Medicine.—A substance too well known to require any special description (See remarks under the preceding and under BARILLA, SAJJI, and REH.) It is antacid and then alterative. "A paste made of equal parts of *yavakshara* and *sajji-kakshara* with water is applied to abscesses for the purpose of opening them" (U. C. Dutt).

Special Opinions—§ "Carbonate of soda (impure), *bāngada khāra*, being the residue left during the manufacture of glass bangles. A second form, which appears to be a purer carbonate of soda, is called *Surāti khāra*; both are used in the treatment of dyspepsia" (C. T. Peters, M.B., *Zandera*, South Afghanistan).

CARBUNCLE.

543

Carbuncle.

The Carbuncle of the ancients is garnet cut, as it is called, *en cabu-*
the stones, when of good
esteem
than the
It is be-
Calcutta"
in South
(*Ball*, *Econ. Geo.*, 3-11, 3-12)
India, where they are known as *Manikiam* (*Lam. & 161.*)

The garnet when cut as a Carbuncle is convex above and hollowed out below, so as to leave but a thin layer of the stone through which the light passes, revealing the bright colour. The finest carbuncles are said to come from Pegu and Ceylon. Conf. with Carnelian.

C. 547

Calcutta.

544
South India.545
Bombay.546
Burma.
547

Heart-Pea or Winter Cherry.

CARDIOSPERMUM
Halicacabum.CARCHARIAS, *Muller and Henle.; Day, Fishes of India, 710.*

548

Carcharias.—Several species of sharks are employed by the natives of India in the preparation of a medicinal oil. It seems probable that the sharks specially selected for that purpose belong to the genus *Carcharias*. Of these *C. gangeticus* is the most ferocious: it ascends the rivers to about the limits of the tidal influence. *C. hemiodon* also goes up the rivers, specimens having been caught near Calcutta. Several other species are frequent in the Red Sea and Indian Ocean, particularly on the coast of Sind. (See SHARKS AND SHARK FINS)

CARDAMINE, *Linn.; Gen. Pl., I., 70.*Cardamine hirsuta, *Linn.; Fl. Br. Ind., I., 138; CRUCIFERÆ.*

549

References.—*Thwaites, Fn Ceylon Pl., 14, Dale & Gills, Bomb Fl., 7, Stewart, Pb Pl., 13; Treasury of Botany*

Habitat.—A herb found in all the temperate regions of India; very abundant in Bengal during the cold weather

Food.—The leaves and flowers constitute an agreeable salad, resembling water-cress.

FOOD.
550

Cardamom, see *Amomum subulatum, Roxb.*—the Greater Cardamom; and *Elettaria Cardamomum, Malon*—the Lesser Cardamom.

Cardamom seed oil, see *Amomum subulatum, Roxb.*CARDIOSPERMUM, *Linn.; Gen. Pl., I., 393.*Cardiospermum Halicacabum, *Linn., Fl. Br. Ind., I., 670; Wight, Ic., t. 508, SAPINDACEÆ.*

551

BALLOON-VINE, HEART PEA OR WINTER CHERRY.

Vern. *Lalaphatkari, naysphatki, noaphutki, sibhihi, BENG; Hab-ul-kalkal (seed), Pb., Karolig, GUJ.; Kanphuti, budha, shibhi, BOMB; Mula-cottan, TAM.; Nalla gulsinda, Kanakna katha-kakara, TEL.; Jyautishmati, Karavi, SANS.; Hab-ul-kalkal, taftaf, ARAB.; Ma-lam, BUKM.; Painara-wel, SING.*

References.—*Roxb., Fl. Ind., Ed. C.B.C., 335, Ainslie, Mat. Ind., II., 204, Thwaites, En Ceylon Pl., 58; Stewart, Pb. Pl., 31, U. C. Dutt, Mat. Med. Hist., 130; Murray, II. and Drugs of Sind, 64; Dymock, Mat. Med. W. Ind., 2nd Ed., 167; Liston, L. P. F. M., 167, S. Arjun, Bomb. Drugs, 14, Baden Powell Pb. Pr., 330, Balfour, Cycl. P.; Treasury of Botany; Rheede, VIII., t. 28; Rumph., II., t. 26, f. 2; Malon's Bur., 503, 753*

Habitat.—A climbing herbaceous plant plentiful in the plains of India; chiefly in Bengal and the North-West Provinces; is distributed to Ceylon and Malacca. Tendrils are modifications of portions of the flower bud; fruit triquetrous inflated.

Medicine.—The root is used in medicine as an emetic, laxative, stomachic, and rubefacient. It also possesses diaphoretic, diuretic, and tonic properties. In combination with other remedies it is prescribed by Hindu physicians in rheumatism, nervous diseases, pleurisy, &c. The decoction of the root is considered aperient by native practitioners, who prescribe it in doses of half a tea-cupful twice daily. It is remarkably and slightly nauseous to the taste. The seed is said to be official in the Panjab (*Hab-ul-kalkal*). Mr. Baden Powell remarks: "It is used as a

MEDICINE.
EosL
552Seeds.
553

C. 553

Heart-Pea or Winter Cherry.

CARDIOSPERMUM
Halicacabum.

CARCHARIAS, Muller and Henle.; Day, Fishes of India, 710.

548

employed by the natives of
t seems probable that the
to the genus Carcharias

Of these *C. gangeticus* is the most ferocious: it ascends the rivers to about the limits of the tidal influence. *C. hemodon* also goes up the rivers, specimens having been caught near Calcutta. Several other species are frequent in the Red Sea and Indian Ocean, particularly on the coast of Sind (See SHARKS AND SHARK FINS)

CARDAMINE, Linn.; Gen. Pl., I., 70

Cardamine hirsuta, Linn.; Fl. Br. Ind., I., 138, CRUCIFERÆ.

549

References.—Thwaites, *Fl. Ceylon* Pl., 14, Dals & Gibs, *Bomb. Fl.*, 7, Stewart, *Pb. Pl.*, 13, *Treasury of Botany*

Habitat.—A herb found in all the temperate regions of India, very abundant in Bengal during the cold weather

Food.—The leaves and flowers constitute an agreeable salad, resembling water-cress

FOOD.
550

Cardamom, see *Amomum subulatum*, Roxb.,—the Greater Cardamom; and *Elettaria Cardamomum*, Maton—the Lesser Cardamom

Cardamom seed oil, see *Amomum subulatum*, Roxb.

CARDIOSPERMUM, Linn., Gen. Pl., I., 393.

Cardiospermum Halicacabum, Linn., Fl. Br. Ind., I., 670, Wight, Ic., t. 508, SAPINDACEÆ

551

BALLOON-VINE, HEART PEA OR WINTER CHERRY

Vern. *Latsaphatkar*, *nayaphatki*, *noaphutki*, *sibjhul*, BENG, *Hab-ul-kalkal* (seed), PB, *Karolio*, GUJ, *Kanphuti*, *bodha*, *shub jal*, BOMB, *Muda-cottan*, TAM, *Nalla gulisenda*, *kimakasa budha kakara*, TEL, *Jyautishmati*, *karavi*, SANS, *Habb ul kalkal*, *tafiat*, ARAB, *Ma-lamai*, BURM, *Painasra wel*, SING

References.—Roxb., *Fl. Ind.*, Ed. C B C, 335, Ainslie, *Mat. Ind.*, II, 204, T. ... C Dutt, Mat. I, Mat. II, Bomb, sury of Bur, ... Dymock, S Arjun, Trea, Mason's

fruit triquetrous inflated.

Medicine.—The ROOT is used in medicine as an emetic, laxative,

MEDICINE.
Root.
552

Panjāb (*Hab-ul-kalkal*). Mr. Baden Powell remarks: "it is used as a

Seeds.
553

C. 553

CAREYA.

The Thistle.

MEDICINE.
Leaves.

554

tonic in fever, and a diaphoretic in rheumatism" The fried LEAVES are said to bring on the secretion of the menses. The following prescription is given by Dr. Dutt as a Hindu cure for amenorrhœa. Equal parts of *Jyautishmati* leaves, *saryakā* (impure carbonate of potash), *Acorus Calamus* root (*vachā*), and the root-bark of *Terminalia tomentosa* (*asana*) reduced to a paste with milk; taken in doses of about a drachm for three days (*Mat. Med. Hindus*) "On the Malabar coast the leaves are administered in pulmonic complaints, and mixed with castor oil, are internally employed in rheumatism and lumbago" Mixed with jaggery and boiled in oil, they are a good specific in sore eyes The whole PLANT, boiled in oil, is sometimes employed to anoint the body in bilious affections Rheede says that rubbed up with water, it is applied to rheumatism and stiffness of the limbs The plant, steeped in milk, has

Juice.

556

..

Dutt. *Drury*, *S. Arjun*)FOOD,
Leaves.

557

Seeds.

558

Food.—"In the Moluccas the LEAVES are cooked as a vegetable" (*Drury*, *U. Pl.*) Lisboa states that in the Bombay Presidency the leaves and shoots are "eaten as green" Balfour remarks that "popular superstition asserts that by eating the SEEDS, the understanding is enlightened and the memory rendered miraculously retentive"

CARDUUS, Linn.; *Gen Pl*, II, 467.

559

Carduus nutans, Linn., *Fl. Br. Ind*, III, 361; COMPOSITÆ.

THE THISTLE

Vern.—*Kanchāri*, *tiso*, *bādamard*, *Pā*, *Gul* *bādamard*, KASHMIRReferences.—*Stewart*, *Pb Pl*, 123; *Baden Powell*, *Pb Pr*, 356; *Dymock*, *Mat Med W. Ind*, 386; also 2nd Ed., 466.

Habitat.—A tall stout thistle, found in the Western Himalaya, from Kashmir to Simla, at an altitude of 6,000 to 12,000 feet, also at Hazara in the Panjāb, and in Western Tibet, at an altitude of 13,000 feet.

Medicine.—The flowers are considered febrifugal in Lahore; according to Mr. Baden Powell, in Kashmir, they are also used to purify the blood

Fodder.—Eaten by camels greedily When bruised, to destroy the
 seasons, when other food is scarce, is
 vernacular names with those given

MEDICINE.
Flowers.

560

FODDER

561

DOMESTIC

562

Domestic.—Murray remarks that the leaves are employed to curdle milk.

CAREYA, Roxb., *Gen Pl*, I., 721

Leaves alternate, not gland-dotted Flowers large, 4 merous Stamens numerous, in several series slightly connate at the base, filaments filiform, innermost and outermost without anthers Ovary 4 5-celled, crowned by an annular disc. Fruit large, globose, fibrous, disseminations absorbed, seeds numerous

A genus, containing only 3 species, and these confined to India, named in honour of the Rev. Dr. Carey—one of the distinguished Serampore Missionaries—a distinguished botanist and a contemporary of Dr. Roxburgh's.

CARICA
Papaya.

The Papaya or Papaw.

MEDICAL
OPINIONS.

one or two grains with sugar or milk after meals should be given to adults. A few drops of juice added to tough meat render it quite tender and fit for immediate cooking. This is very desirable in the case of invalids. Tincture of the juice does not keep well and is disagreeable to taste. A syrup of the powder may be made if required for children and delicate women" (*Surgeon R L Dutt, M D, Patna*). "The milk-like juice of the green or unripe fruit is a good digestive, and most efficacious in dyspepsia. I have frequently prescribed it with marked success. The ripe fruit is alterative, and if eaten regularly every morning, corrects that habitual constipation so common in India. The dry fruit is said to promote the secretion of bile in several cases without being unfavourable, but I think the good effect was chiefly owing to the maintenance of a uniform heat. However, more experiments are necessary to decide the question. The leaves should be gently bruised and heated in a pan and applied warm to the breast. The dose of the milk like juice is 30 drops, mixed with water, two or three times a day. The juice must be fresh, as it decomposes quickly, but it may be obtained by picking the green fruit on the tree and collecting the white fluid in a glass" (*R A Barker, M D, Civil Surgeon, Dumka, Santal Parganas*). "The ripe fruit is very pleasant eating indeed. The leaves of this tree have the peculiar property of making tough meat tender. If a fowl, recently killed, be wrapped up in papaya leaves for a couple of hours, and then cooked, it will be as tender as if it had been hung for 24 hours. I have seen spleen grow smaller in young persons who have been treated with the dried and salted fruit. The juice called *papsine* has digestive ferment properties and will remove thickened skin, as in eczema and corns. It is also said to be a

diarrhoea" (*Assistant Surgeon Nehal Singh, Saharanpur*). "Papaya juice is used in dyspepsia as a vegetable substitute for pepsine" (*Surgeon R Gray, Lahore*). "It has the property of rendering meat tender and of facilitating the process of cooking. It contains a vegetable peptine and can be used as pepsine" (*Brigade Surgeon F H Thornton, B A, M B, Monghir*). "The juice has great solvent properties. If dropped on raw meat, it dissolves it in a few minutes. The green fruit when boiled with meat renders it tender. The green fruit is used as a vegetable. Is a mild laxative and diuretic. The ripe fruit is cooling at first, but has a

it has rubefacient properties. Hospital Assistant Gopal Chunder Gull reports that meat softens when boiled with the unripe fruit cut into pieces, it is also used in the form of curry by the natives" (*Surgeon Anand Chunder Mukerji, Noakhally*). "

(*Surgeon D. J. Hall*)
to possess digestive

CARICA
Papaya.MEDICAL
OPINIONS.

fruit, in doses of 1 grain injected hypodermically, will remove the morbid tissue within the area of its contact. Fever is occasionally excited as well as local irritation, and hence this mode must be pursued carefully. I have used the inspissated juice also in the form of pills in 2-grain to 4-grain doses for the same disease. The result seemed favourable, but as other methods were used the matter is open to doubt" (*Surgeon W. G. King, M B, Madras*). "The leaves are used externally for nervous pains. The leaf may be either dipped in hot water or warmed over a fire and applied to the painful part" (*Surgeon-Major W. Nolan, M D, Bombay*). "The seeds are considered to be anthelmintic" (*Surgeon-Major J. Robb, Ahmedabad*).

The above opinions show how widely and uniformly the properties of the *papaya* are believed in by Native and even by European Medical Officers.

FOOD
Ripe fruit.
589
Green fruit
Curries and
pickles.
590
Other modes
of preparation
591

Food—When ripe the fruit attains the size of a small melon, the interior is soft, yellow, and sweetish, eaten by all classes and esteemed innocent and wholesome. When green it is cooked by the natives in their curries and also pickled. The ripe fruit has a flavour peculiar to itself, the better qualities are eaten without sugar, and by many persons are ranked among the first of eastern fruits. By others the *papaya* is eaten with pepper and salt. The seeds have a pleasantly pungent taste, not unlike mustard, hence in all probability the idea occasionally alluded to that this is the mustard tree of the scriptures. Lisboa says the fruit has a sweetish taste and makes an excellent tart. When boiled in slices it is eaten as a vegetable. Don says that in South America the fruit after being boiled and mixed with lime juice and sugar is used in place of apple sauce. Sloane remarks that the unripe fruit is cut into slices and soaked in water till the milky juice is removed. It is then boiled and eaten as turnips or baked as apples. A few drops of the milky sap of the *papaw* is said to render meat tender. The author of the *Mahlesan* recommends that for this purpose the juice should be mixed with fresh ginger. In Barbadoes the flesh of animals is reported to be hung on the tree over night in order to soften it. This idea prevails all over India and is doubtless often resorted to by domestic servants. Drury confirms this and states that he has personally tested the accuracy of the popular notion. Dr John Davy (*Edin Ph I, 1855*) declares that this is due to accidental causes. According to some writers the best plan to soften meat is to wrap it overnight in the *papaw* leaves, or to drop a little of the fresh juice into the vessel in which the meat is being cooked. Brandis mentions another process, namely, to wash meat with water impregnated with the milky juice. It is even stated that meat is rendered tender by causing the animals to eat the seeds before they are killed. The best qualities of *papaw* are said to be obtained from Singapore and Moulmain stock. "The green fruit, when peeled, boiled, cut into small pieces and served with sweet oil, vinegar, salt and pepper, serves as a very palatable vegetable, and is very similar to squash in taste" (*Mrs L. Loaford*).

Juice
592

TIMBER
593

DOMESTIC.
594

Structure of the Wood—The stem of this fast growing tree is too spongy and fibrous to be regarded as affording timber. Gamble describes it as soft wooded.

Domestic—The juice is used by native ladies as a cosmetic to remove freckles. It is also exceedingly acrid, causing blisters and itching if applied to the skin (*Treasury of Botany*). "The leaves are employed by the Negroes in washing linen as a substitute for soap" (*O'Shaughnessy*).

C. 594

The Blistering Papaya of Brazil.

CARISSA
Carandas

Carica spinosa.

A branching tree met with in Guiana and Brazil, has a much more acrid juice than the other species. If dropped on the skin it causes disagreeable blisters. The fruit is not eaten, and its flowers have a carr drug

MEDICINE
Juice.
595

CARISSA, Linn., Gen. Pl., II, 695

A genus of densely branched, spinous erect shrubs, belonging to the APOCYNACEÆ. There are some twenty species African, Asiatic, and Australian. Sir J. D. Hooker remarks of the five Indian species that they are pro-

Carissa Carandas, Linn., Fl. Br. Ind., III, 630, Wight, Ic., t 426, APOCYNACEÆ

596

Syn — C. CONGESTA, Wight, Ic., t 1259, Bedd., Fl. Sylv., Man., 156, Anal., t 19, fig. 6

Vern — Karaunda, karānda, or karonda, garanga, karrond, timukhia,

R

Brandis For. Fl., 330

Timb., 261, Dals. & C.

191, Stewart, Pb. Pl.

Dymock Mat. Med.

Atkinson's Fl. Ind.

Tans of Beng., 142, 1

Botany, Firminger, Man. Gard., 256

Habitat — A dichotomously branched bush, cultivated for its fruit in most parts of India, said to be wild in Oudh, Bengal, and South India. In the Panjáb and Gujarat it frequents hedges, and forms spiny, low, dense bushes, is also found in Burma, Ceylon, and Malacca.

It flowers from February to April and produces a small fruit which is grape green when young, white and pink when approaching maturity, and nearly black when ripe. The fruit is ripe in July to August.

Dye — Dr. McCann states that in Bhagalpur the fruit is used as an auxiliary in dyeing and tanning. The milky fluid which exudes from the wounded part of the fruit when gathered is very adhesive.

Medicine — The unripe fruit is astringent, and the ripe fruit cooling, acid, and useful in bilious complaints. The root has the reputation of being a bitter stomachic. "It is used as a plaster in the Concan to keep off flies, and pounded with horsepiss, limejuice, and camphor as a remedy for itch." (Dymock)

Special Opinions. — "It is considered to be antiscorbutic and is used in the form of curry and chutney by the natives" (Assistant Surgeon Anund Chunder Mukerji, Aizawl). "Antiscorbutic, expector-

DYE
Fruit.
597
MEDICINE.
Fruit.
598
599

CARISSA
spinarum

The Karanda.

MEDICINE.

ant" (Surgeon W. F. Fyfe, F. S. S. S.). "The juice is sweet and capable of producing ulcers. The ripe fruit is a pleasant berry well with food, and has, I believe, no medicinal properties" (Surgeon Major J. M. Fyfe, F. S. S. S.). "The description of the leaves is very much used at the common market of remittent fever" (Surgeon Major P. N. M. Fyfe, F. S. S. S.).

FOOD
Pickles
600
Preserves
601
TIMBER
602
DOMESTIC
Fences
603

Food.—The fruit is made into pickles before it is ripe, and is also employed in tarts and puddings. For these purposes it is superior to any other kind of fruit (Fleming). When ripe it takes a very good jelly (equal to redcurrants) for which it is cultivated in the gardens owned by Europeans. The natives universally eat the fruit when ripe, and excepting pickling they do not cook it.

Structure of the Wood.—White, hard, smooth, close-grained.

Domestic Uses.—Makes excellent strong fences. Its number of strong, sharp thorns, renders such hedge almost impassable. (Koch)

Carissa diffusa, Roxb., Fl Ind., Fl C. B. C., 231; Syn for *C. spinarum*, A. DC., which see.

604

C. macrophylla, Wall., Fl Br. Ind., III., 631.

Syn.—*CARISSA LANCEOLATA*, Dalz.; *C. DALZELLI*, F. S. S., Fl Syl., Mar. 1877.

References.—Dalz. & Gilb., Bom Fl. 1851; Liston, U. Fl. of Bom., 1854.

Habitat.—A large shrub with very strong, curved thorns, common on the Deccan peninsula, Coorg (Heyne), Konkani at Ramghat (Dalzell); Courtallum (Wight). The flowers are much larger than those of the other species.

Food.—The fruit is eaten, it is about the size of a plum and ripens in May. Beddome says it is superior to that of *C. Carandas*.

FOOD,
Fruit,
605
606

C. spinarum, A. DC., Fl Br. Ind., III., 631; Wight, Ic., t. 427.

Syn.—*C. diffusa*, Roxb.

The *Flora of British India* regards this species as probably only a state of *C. Carandas*, concurring in this opinion with Dr. Brandis. It is mainly distinguished by its being a smaller plant, with shorter and more slender spines, more acute leaves, and a smaller berry.

Var. *hirsuta* is more pubescent than the type condition. It is *C. villosa*, Roxb., Ed., Carey and Wall., and also of Wight, Ic., t. 427—a form which Roxburgh regarded as quite distinct from the others described by him and of little economic value.

Vern.—Karaunda, HIND; Gān, garinda, garina, PO; San karaunda, anka kōli, URDU; Karamadika, SANS; Wakulu, TEL; Kanuwani, ORAO.

References.—Roxb., Fl Ind., Fl C. B. C., 231; Brandis, For Fl., 321; Kurz, For Ind., 165; Baden Powe, four, Cyclop. Bom., 166.

Habitat.—A small, thorny, evergreen shrub, wild in most parts of India, especially in the drier zones and in the plains of the Panjab, the

The Carnelian.

CARNELIAN

Medicine.—This plant is mentioned by Baden Powell amongst his drugs of the Panjab, but its supposed properties are not stated.

MEDICINE.

Wood.
607

which is given as a tonic and enolagogue (*Jr. Stewart*).

Food—The fruit is eaten in tarts. The leaves are greedily devoured by goats and sheep.

FOOD.

Fruit

608

FODDER.

609

TIMBER.

610

DOMESTIC.

Fences.

611

Fuel

612

Structure of the Wood.—Hard, smooth, close-grained, said when very old (in Kangra) to be black and fragrant (*Brandis*). It is generally gregarious, often forming undergrowth in the forests of *Pinus longifolia*, of bamboo, and occasionally of teak. It is used for turning and combs.

Domestic Uses.—Largely used for dry fences, but spreads so rapidly where clearances have been made that it may impede the reproduction and growth of the forest. It coppices freely and makes excellent fuel.

CARMINE.

Carminic Acid and Carmine.

CARMIN, *Fr.*; KARMIN, *Germ.*; CARMINIO, *It.*

References.—*Balfour's Cyclopæd.*; *Ure's Dictionary of Arts, Manuf., and Mines*

613

The uses of Carmine have recently been greatly extended. It is employed for making fine red inks and for silk-dyeing. It is the finest red the water-painter, and more especially the miniature painter, possesses. The French carmine and rouge is preferred to the English. See *Cochineal*.

Carnation. See *Clove*.

CARNELIAN.

614

quartzose minerals into—

1st—Transparent Crystallised Quartz or Anhydrous Quartz, as represented by the ROCK CRYSTALS. These, when violet, are known as the Amethyst, and when yellow or sherry-coloured as the Carnegorm, but numerous intermediate shades also exist from red to black.

nate this series, or Agate and Chalcedony are used as synonymous terms.

3rd—Uncrystalline Semi-transparent to Opaque Hydrated Quartz.—The OPAL may be given as the type of this group.

C. 614

CARNELIAN.

The Carnelian.

QUARTZ.

The quartz stones referred to in the above section are extensively used in India for ornamental purposes, in the lapidary art, in decorative architecture, and in the manufacture of cheap jewelry. They are very largely a good article with the "inferior gems"—the diamond, ruby, sapphire, emerald, pearl, &c., being classed as the "prima" or "precious stones and gems." Some of the better quartz is of opal character and to them, however, a point is with the gems, and indeed a little to our flaking opal is one of the prettiest of all stones. The quartz minerals were apparently unknown to the ancients, and when first brought to their attention probably it is proper. Pliny mentions that fragments of a small Canby cup were exhibited in the theatre of Nero "as if," said Pliny, "they had been the ashes of no less than Alexander the Great himself." Balfour says with much truth that "amongst the people of India the inferior gems are held in but little esteem; they value a gem for its intrinsic price, not for the workman's skill expended in shaping it, in which the chief value of all the inferior gems consists." As to this is so the trade in the inferior gems, both internal and foreign, is far more extensive than it is possible, with our present means of determining, to definitely express. Indeed, the utmost that can be done in this direction, is to remind the reader of the elaborate decorations of the Taj Mahal of Agra and of the other similar monuments of the Moghul Empire, in order to convey an idea of the extent the art of lapidary decoration prevailed during that period, and to add that there is little to justify the con-

for its cheap lapidary work, while sapphires and the carnelians have an increased rather than a diminished industry in ornamental stones. The extent of the foreign trade in certain of the of the Indian lapidary industry known under the generic name of *ma-hu-ya*.

EXPORTS
615

EXPORTS FROM INDIA OF INFERIOR GEMS.—Under the heading JADE STONE Burma is said to have exported, since the beginning of the present decade, the following quantities and values:—

YEARS	Quantity.	Value
	cwt	R
1880-81	3 371	8,03,890
1881-82	2,783	23,01,800
1882-83	4,159	9,00,900
1883-84	3,849	8,12,960
1884-85	3 738	5,00,050
1885-86	3	050
1886-87		50

Thus during the past sex-
half a million of pounds sterling

Burma
amount

Exports of Inferior Gems

CARNELIAN.

exclusively to China and the Straits Settlements. This does not of course include the exports from the mines (in Mexico & Mexico) by land to Yunnan & China. Dr. Anderson, for example, in his *Journeys to Yunnan*, describes the very important industry in jade at Momein, where the stone is worked into ornaments. The Administration Reports of British Burma, which deal exclusively with that portion of the trade in jade which comes down the Irrawaddy to Rangoon, allude to jade as one of the standard articles of export trade from that province. It is shown for example, that of the total trade in 1891-92 jade represented 82.8 per cent. of the exports, teak wood 7.64 per cent., rubber 2.6 per cent., and jade-stone .351 per cent.

EXPORTS.

jade, in rock crystals, and in the nobler gems may in the future be considerably extended. The exceptional development of the trade in 1881-82 was due to the discovery of a new mine and the decrease that followed accounted for by the jade thus sent into the market having proved much inferior to the stone usually exported.

An inferior quality of jade-stone is also found at Mirzapur, and a very considerable trans-frontier trade is done in the Panjab in Karakash jade from Turkistan, and in jade and imitations of jade or false jade from Kashmir. (See on a further page, under *AGATE*, variety *flama*.)

We have alluded to jade in the present connection, not from an established belief that it belongs to the quartzose group of minerals with which we are at present dealing, but because it is one of the so-called inferior gems. The chalcedony and rock crystal gems, however, are even as extensively employed in India as jade-stone, yet it has been found difficult to furnish definite facts regarding the extent of the internal and foreign trade in these. Perhaps the most interesting of the early accounts of the Cambay trade and industry in "Cambay stones" and Rājapīth Carnelians was written in 1787 by an explorer—Dr. T. Hove—who has not obtained from the writers of the past hundred years the high position which his botanical, zoological, and geological researches in Bombay merit. Dr. Hove states that while he was in Cambay a very considerable trade existed with Europe and Arabia in seal-shaped stones, and with China in pearl-shaped stone, as large as a pistol ball.

From *W. Burn's Oriental Commerce* we learn that the sales, during the Honourable East India Company's time, fluctuated as much as they do at the present day. The average is now, however, much higher than during the first few years of the present century.

The following figures give some idea of the trade.—

The exports were valued in—

	R
1804 at	49 140
1803 at	54 240
Passing over 70 years they were in	
1874 valued at	84,370
1878 at	50 970
but the returns for the five years ending 1878 show	
an average of	70,000

CARNELIAN.

The Rock Crystal.

ROCK
CRYSTAL
616

We must now describe, as briefly as possible, the principal quartzose inferior gems —

1st—ROCK CRYSTAL, *Mallet, Mineralogy, 62.*

Vern — *Bilaur, Hindo., Phatak, Gujrati; Tansala (smoky Cairngorm),*
 Pn The Burmese name for an Amethyst signifies "egg plant, Sapphire"

References — *Ball's Econ Geol, 501, Dalfour, Cycl of India, Bomb*
Gas, VI, 201, Mason's Burma (1820) p 579, Calcutta Jour Nat
Hist, II, Madras Jour, II and Sci, XII, 172, Mysore Gaz, I, 29;
Central Prov Gaz, 506, Oldham, Jour As Soc, Beng, XXIII, 271.

CHARACTER OF — When pure this mineral consists chiefly of silicic acid, it is an oxide of the carbon-silicon group. The differently coloured forms of rock-crystal owe their tints to the presence of small quantities of foreign minerals. These coloured crystals are known by various names such as the Amethyst, Cairngorm, Rose quartz, Pellucid quartz, False-topaz or Citrine, Smoky-quartz, Milky-quartz, Prase, Aventurine quartz, &c

COLOURING OF. — Artificially, all these and many other shades are, however, may be passed off on the ignorant sapphire. The following account of rock crystals is reproduced from

Dr. Ballour's *...* — "If made red hot, and plunged repeatedly into a tincture of cochineal, it becomes a ruby, if into a tincture of red sandal, it takes a deeper red tint, into tincture of saffron, a yellow, like the topaz, into a tincture of turnesol, a yellow like the topaz, into a mixture of tincture of turnesol and saffron it becomes an imitation of the emerald" Crystals coloured red are known in France as *rubaces* — false rubies

mon at *...* beauty and variety have been reported from the Rajmahal in the Gurgaon, Bannu, Sháhpur, and crystals of a large size have been found to pass off coloured crystals as rubies. Large crystals are found in their country. Milky-quartz occurs in Mergui

ECONOMIC USES AND MANUFACTURES OF — The lapidaries of Vellum have the reputation of being skilled as workers in the different varieties of

found in the district and the cairngorms — the brilliant, ring, Sam- t the &c, cut in transparent quartz were found. These are supposed to have been cut out of large crystals found at the Arval quartzites in the neighbourhood. The Shans of Upper Burma are said to be experts at making imitation gems from rock crystals.

C. 616

The Agate.

CARNELIAN.

2nd—AGATE, Mallet, *Mineralogy*, 70.AGATE.
617

The name Agate is supposed to be derived from the *acates* (ἀγάρις) river in Sicily, or from *akik*, a river, in Arabic. ACATE Fr., *Achat*, GERM., *Akik*, ARAB., *Yamni*, HIND (agate), *Chakmak* (a flint), HIND, *Mink*, HIND (cut agates and beads brought from Kandahar), *Asshar*, HIND (Silica), *Pathanni*, HIND (blood-stone).

They are commonly known to Europeans as Cambry stones or Godavery pebbles.

References—*Hamilton, Capt* (1781), *New account of the East Indies*, I., 143. *Hove, Dr* (1757) *Explorations in Bombay* *Sel Acc*, *Bomb Govt*, XII., pp. 42 to 51. *Kennedy Dr* (1827), *Trans Met & Phys Soc*, *Cale*, III., 425. *Wallace, Major* (1854) *Sel Acc*, *Govt*, *Bomb*, XXIII., 29. *Tod's Travels*, *Campbell & M.*, *Bomb Gaz*, III., 13. II., 32. VI., pp. 190 to 208, & XXIII., *Ct*, *Mason Acc*, I. (1860) *Prod Burma*, p. 18. *Hynne, A. B.* (1875), *Mem Geol*, S. I., III., 28.

SOURCES.—Ind. Agates are mainly obtained from the mines of Rewa Kantha in the Bombay Presidency, but they exist also in Bengal in the Raymahal and Singhbhum districts, in Hyderabad, and in the Central Provinces at Jabulpur.

Mr. Campbell thus writes of the Bombay Agates—"Four Agates—the common, the moss, the lapidary, and the veined—rank next to the Rajpipla Carnelian. The common Agate is of two kinds—a white half clear stone called *dola* or *chistandar*, and a cloudy or streaked stone called *jania*. The colour varies but is generally a greyish white. Both kinds come from north east Khatwa, near Maleddur in Morvi, three miles from Tankra. Of the stones which lie in massive blocks near the surface, the most perfect do not exceed five pounds in weight while those of inferior quality, in many cases cracked weigh as much as fifty pounds. These stones are of a fine texture, and are very hard."

who pay in
to gather it
and being

"Like the common Agate, the stones are of two kinds—the common and the lapidary, three miles from Tankra in Morvi. Found in the ground about two feet under the surface in massive layers often cracked and from half a pound to six pounds in weight they are gathered in the same way as the common Agate. When worked up they take a fine polish, and are on a base of crystals, some very clear, some more clouded, ranging as of dark green or red brown tints."

"Besides, from the town of Kanadary in Kaira where, as a name shows, the lapidary Agate is chiefly found, there are also stones from the bed of the river M'jam between the Agency of Amra and Mithi, about 15 miles from Kanadary. It is found in the banks of the bed of the river in round blocks and is of a deep red colour, from a pound to ten pounds in weight. The trade names for these stones are *chistandar* and *jania*."

"The most valued Carnelian is the veined one, and is found from Rewa Kantha in the Agency of Morvi. It is found in the same way as the common Agate, and is of a fine texture, and is very hard."

CARNELIAN.

The Agate.

AGATE.

showing either a dark ground with white streaks, or dark veins on a light black ground."

CHARACTER OR.—Agates are concretionary masses or nodules, which occur usually in bellmas or veins in volcanic rocks. When cut across the sections show layers. "The colour markings are often in concentric rings of varying forms and intensity, or in straight parallel layers or bands. The colours are chiefly grey, white, yellow or brownish red." The composition of most of the forms of agate and carnelian is from 70 to 96 per cent. of silica, with varying proportions of alumina, coloured by oxide of iron or manganese.

COLORING OR.—When the colours are indistinct or not deep enough they are readily intensified by artificial means. *Ure* says: "By boiling the colourless stone in oil, and afterwards in sulphuric acid, the oil is absorbed by the more porous layers of the stone; it subsequently becomes carbonised, and thus the contrast of the various colours is heightened. The red varieties, also, are artificially produced by boiling them in a solution of proto-sulphate of iron; after which, upon exposing the stones to heat, peroxide of iron is formed, and thus red bands or rings of varying intensities are produced. Carnelians are thus very commonly formed, the colouring matter of the true stone being a peroxide of iron."

the stones which should be treated as forms of agate. The following are those most frequently described as such (separating the Carnelian by itself):—

1. "*Mocha stones*, originally brought from the East, are clear greyish chalcedonies, with clouds and dashes of rich brown of various shades. They probably owe their colour chiefly to *art.*" *Mocha stones* are found in Dekkan traps. *Irving (Med. Top. of Ajmere)* mentions them as found in the bed of the Chambal.

blood drops.

4. "*Pl.*
the Schw
coloured
in Upper

hâr and is brought down the Indus on rafts floated with inflated skins to Attock. It is then conveyed to Bhera, where it is extensively employed by the lapidary cutlers. *Plasma* has been reported as found in the Nizam's territory south to the Bhima river, and Dr. *Voysey* mentions a form of *plasma* as seen in the Dekkan trap of the Sâvilgarh hills.

5. "*Chrysoprass*, found in Silesia, is an agate coloured apple-green by oxide of nickel."

6. *The Scotch Pebble or Fortification agate.*—This is a form known chiefly by its zigzag pattern.

USES OR.—Agates are used in various poses. These are: sword hilts, beads, paper-cutters, &c., &c.

The Carnelian.

CARNELIAN.

ing in marble and to a certain extent are so employed at Agra and other places, where marble plates, boxes, &c, are made. Agates are also used for burnishing gold and silver and by the book-binders; they are made into the finer mortars used by the chemist, as well as employed for the pivots of chemical balances, &c.

Some doubt seems still to exist as to the material of which the *myrrhine* cup which Nero paid £56,000 for was made. Professor Muller seems to be of opinion that it was flourspar, but Ball very properly comments upon this opinion: 'if it was obtained at Ujein or Ouzen, or any other locality within the trappean area, it was almost certain to have been one of the chalcadonic minerals, *viz.*, carnelian or agate. Flour spar is not known to occur in the trap.'

3rd—CARNELIAN (from *Caro-nis*, flesh, in allusion to the colour);

Mallet, *Mineralogy*, 72.

CARNELIAN
618

CORNALINE. *Fr.*; KARNEOL. *Germ.*; CORNALINA, *It.*

Veru—Sang: dki
Kandahār, Ps;
Gujarati. One o
thine, or fowl's bl
nel ans

References.—Ball, *Econ Geol*, 506, Balfour, *Cycl*, I, 555 & 583. *Encycl. Brit*, I, 277, *Ure's Dict*, Arts, &c, I, 636, *Baden Powell*, Pb Prod, 97, *Copeland*, *Bomb. Researches*, Thomson, *Mad Jour*, Lit and Sci, V, 161.

Mr. J. M. Campbell, in his *Gazetteer of the Cambay States*, gives an instructive account of the history and present position of the industry in agates and carnelians. Space cannot be afforded to do more than to single out, in the following remarks, the prominent features of that trade, the reader is referred for further information to Volume VI of the *Bombay Gazetteer*. The works and journals referred to under Agate may also be consulted.

CHARACTERS OF—Dana defines the carnelian as a reddish variety of chalcedony, generally of a clear bright tint, but it is sometimes of a yellow or brown colour, passing into common chalcedony through greyish red. White carnelians also occur and are prized, but they are rare.

SOURCE—The principal sources of *Agave* are the mines of Rátanach, Agates come mainly from the Nerbadda, and from R on the Nerbadda, and abundantly so in Japan, o found in Burma,

ARTIFICIAL COLOURING OF AGATES INTO CARNELIANS.—While collecting the pebbles the miners divide them into two primary classes—

...t are,
mora
yellow
ed to

bring out their colour. "During the hot season, generally in March and April, the stones are spread in the sun in an open field. Then in May, a trench, two feet deep by three wide, is dug round the field. The pebbles are gathered into earthen pots, which, with their mouths down and a hole broken in their bottoms, are set in a row in the trench. Round the pots goat or cowdung cakes are piled, and the whole is kept burning from sunset to sunrise. Then the pots are taken out, the stones examined, and the good ones stowed in bags. About the end of May, the bags are

C. 618

The Opal and the Cat's Eye

CARNELIAN.

USLS OR — Sometimes employed for seals

The HELIETROPE is by most writers treated as a form of jasper, but by some it is regarded as a form of bloodstone (see under AGATE No 617). It may almost be said in general appearance to differ from green jasper merely in being spotted or streaked

6th—OPAL; Mallet, Mineralogy, 80.

OPALE Fr., OPAL, Germ., OPALO, It., Dhūdia pathar, HIND
Chalcedony and Opal are sometimes known as Gomēd sannibh, HIND

This is a compact uncrystalline semi transparent to opaque hydrated silica. When of milky white colour, opalescent, and exhibiting a rich play of colours, it is the *Noble Opal*. When not opalescent it is the *Common Opal*. The former are obtained chiefly from Hungary and

While
ig come
na, and
ore and

Sitabaldi

On being first dug out of the earth opal is said to be soft, and to harden and diminish in bulk on being exposed to the atmosphere.

7th—CAT'S EYES, Mallet, Mineralogy, 69.

This stone is perhaps closely allied to Onyx, but by some writers it is placed nearer rock crystal. It is a translucent quartz, presenting a peculiar opalescent reflection, said to be due to the presence of asbestos. It is called cat's-eye from the resemblance it bears to the eye of a cat, and, their name for the stone, the stones are common and are found are not known.

Malabar Coast is generally accepted as a form of cat's eyes. They are sent from Cambay to Bombay. The
ecu
vers
Rori

and Lussund are names given to a much valued pebble, found scantily with cat's eyes in the Rajpipla mines of Bombay (*Select Records, Bomb, New Series, No IV, 31*)

LAPIDARIES' ART

It is not proposed to deal with this subject in the present article, it having been deemed desirable to give in one place under "LAPIDARY" an abstract of all that is known regarding this industry, not merely as

gems —

Bom Gaz, VI, 201. Hoey, Trade and Manuf of Northern India, pp 54 and 119. Baden Powell, Pb Manuf, 192. Kipling, Cat Cal Intern Exh, Pb Section, 28. Burma Admin. Rep, 1882-83, p 64. Hendley, Indian Art Journ, Part 2, 28

The above account of the inferior gems was in type before the writer received Mr Mallets Vol. IV of the "Manual of Geology of India"

JASPER

HELIETROPE

OPAL.
621

CAT'S EYES,
622

Carpets.

CARPETS AND RUGS.

PILE
CARPETS.

ments of chemical laboratories with their processes introduced; and such a system of organised work set up as completely transformed not only the trade but actually the carpets themselves which were the foundation of it." But may it not fairly be asked, since pile carpet-weaving is admit-

sect, who are said to be descendants of Persian settlers. So in Bombay, and indeed in most parts of India, the weavers are to this day Muhammadans

created such as exists. It was not until the Exhibition of 1862, that the Panjáb was known beyond its border for the production of carpets, and then only by the productions of the Lahore jail executed for a London firm. There exist no specimens to show that the Multan industry, the only indigenous one of the province, was of either artistic or commercial importance. The success of the Lahore jail led to the introduction of the

the influence of the Government Schools of Art and the jails but at present I feel that it is chiefly due to the influence of English commerce on the historical handicrafts of India." This seems a much more likely explanation, and that a considerable trade was done in western and southern India, in Indian pile carpets, previously to the Exhibition of 1851, is undeniable. Reference is repeatedly made to this trade in the records of the Hon'ble East India Company's proceedings. This, for example, is alluded to as follows in the *Gazetteer* for Cambay:—

"Cambay carpets had once a great name. Among the articles mentioned in the proclamation of 1630 'for restraining the excess of private trade to the East Indies,' are rich carpets of Cambay. Later on a chief part of the Senior Factor's duty at Cambay was to buy carpets 'valuable in Europe,' and in another place Cambay carpets are spoken of as equal to any of Turkey and Persia. Though this trade has greatly fallen off, there are still four carpet factories, each paying the Nawab a yearly tax of £1-10-0 (Rs 15)."

That the extent and character of the Indian pile carpet trade has declined is all but universally admitted.

Pile carpets are made of cotton at Hyderabad and at many other places, tufts of cotton yarn being used in place of wool. In the same way expensive pile carpets are made of silk, but more frequently silk is used

1-hair
to be
fetch

higher prices than the others."

Pile Carpets ARE MADE at a limited number of jails in each Presidency and Province and by a few private manufacturers scattered here and there over the country. The references given to the *Gazetteers* convey some idea of the distribution of the industry, but it may be concluded that

CART AND CARRIAGE BUILDING. Woods used for.

PILE
CARPETS.

the car-
Agra,
Sind,
Masul
abad and Benares are best known.

For farther information the reader is referred to the articles "COTTON," "HAIR," "PASHM," "SILK," and "WOOL." For the dyes used in carpet making to the article "DYES and DYEING."

Complete information as to the places at which various kinds of carpets, cotton and woollen, are made can be obtained from the authorities of the Indian Museum in Calcutta.

629

CARPINUS, Linn.; *Gen. Pl.*, III., 405.

Carpinus faginea, Lindl.; *DC. Prodr.*, XVI, 2, 127; CUPULIFERÆ.

Vern.—*Shirash*, *imar*, *bijawri*, Pb.; *Gish*, N.-W. P.

References.—*Brandis*, *For Fl.*, 492; *Gamble*, *Man Timb*, 390

Habitat.—A moderate-sized tree of the Himālaya, from Kumaon (and Nepal?) eastward, altitude 4,000 to 7,000 feet.

Structure of the Wood.—Similar to the next species.

TIMBER.

630

631

C. viminea, Wall.; *DC. Prodr.*, XVI, 2, 127.

INDIAN HORNBEEAM.

Vern.—*Charhhri*, *kai*, Pb.; *Pumne*, *goria*, *chamkharak*, N.-W. P., *Chuklan*, *konikath*, NEPAL.

References.—*Brandis*, *For Fl.*, 492; *Kurz*, *For Fl. Burm*, 477; *Gamble*, *Man. Timb*, 390; *Stewart*, *Pb Fl.*, 200; *Baden Powell*, *Pb. Pr.*, 572, *Balfour*, *Cyclop.*

Habitat.—A moderate-sized tree of the Himālaya, from the Ravi eastward, from 5,000 to 7,000 feet, frequent near water. Also met with in the Martaban Hills, altitude 5,000 to 6,000 feet, and, according to Brandis, on the Khasia Hills.

Structure of the Wood.—White, shining; no heartwood, warps in seasoning. Weight 50lb per cubic foot, growth moderately slow. The stem is irregular in section, like that of the European *Hornbeam*, which it much resembles both in bark, wood, and general appearance. Gleghorn states that it is much esteemed by carpenters.

Carrot. See *Daucus Carota*, Linn.; UMBELLIFERÆ.

632

CART AND CARRIAGE BUILDING—Woods used for—

During the Colonial and Indian Exhibition two conferences were held to examine the timbers shown in the Imperial Indian Section. Mr.

The Safflower.

CARTHAMUS
tinctorius.

hot dry weather of the north seasoned the wood in a way very much superior to the artificial methods employed in Europe." The following are the timbers used in India for these purposes, more especially those marked* —

WOOD USED
FOR CART
AND CARRI-
AGE BUILD-
ING.

Acacia ferruginea (carts)
A. melanoxylon (coaches, railway
Albizia amara (carts) [carriages)
Barringtonia acutangula (carts)
B. racemosa (carts)
Bassia longifolia (carts)
Berrya Ammonilla (carts)
Briedelia montana (carts)
B. retusa (carts)
Calamus Rotang (carriages)
Careya arborea (carts).
Cassia Fistula (carts)
Chloroxylon Swietenia (carts)
Cynometra ramiflora (carts)
*Dalbergia latifolia (wheels, gun-car-
riages)
*D. Sissoo (felloes, naves; carts).
Diospyros melanoxylon (cartriage
Eugenia Jambolana (carts). [shafts)
Ficus bengalensis (cart yokes)
Gmelina arborea (carriages, palan-
quins)
*Hentiera littoralis (buggy shafts)
Hymenodictyon excelsum (palan-
quins)
*Lagerstrœmia Flos-Reginæ (carts,
gun-carriages)

*Lagerstrœmia parviflora (buggy
Melia Azadirachta (carts) [shafts)
Michelia Champaca (carriages)
Milnsa velutina (carts)
Mimrops Elengi (carts)
Prosopis spicigera (carts)
*Pterocarpus indicus (carts, gun-
P. Marsupium (carts) [carriages)
Pterospermum suberfolium (carts).
Sandonicum indicum (carts)
Sapindus emarginatus (carts).
Schleichera trynga.
Shorea robusta
Strychnos Nux-vomica.
S. potatorum.
Tectona grandis (railway car-
Terminalia Arjuna. (riages)
T. bellerica.
T. Chebula.
T. tomentosa.
Thespesia populnea (carts and car-
riages)
Ulmus integrifolia (carts).
Vitex altissima (carts)
Xylia dolabriformis (carts).
Zizyphus xylopyra (carts).

CARTHAMUS, *Jinn. Gen Pl. II, 483*

Carthamus oxyacantha, *Nieb. Fl. Br Ind. III 356*, COMPOSITE

633

Vern — *Kantari* *Kandira* *gal*, *Kharee* *Khar*, *gol yān* *Pa*

References — *Stewart Fl II, 123*; *Atchison Cat. Fl Pl 83*; *Baden Powell Fl Fr., 355*, *Cooke On s and Outcrops 34*; *Es Four, Cyclop*

Habitat — Wild in the North-West Provinces and the Panjāb, most common in the more arid tracts. Mr O B Clarke thinks this may be the wild form of Safflower

Oil — Dr Stewart says that near Peshāwar and elsewhere in the Panjāb, an oil is extracted from the seeds which is used for medicinal purposes, as well as for food. Dr Stocks probably alludes to this when he says, under the oil from the seed of *C. tinctorius*: "There is a wild seed" in Sind "which is also called *Poward*, but it is of no use"

OIL
634

Medicine — Dr Bellow remarks that the oil is used medicinally

Food — The seeds are sometimes eaten by the natives parched, alone or with wheat, or are ground and mixed with wheat flour.

MEDICINE
635
636
637

C. tinctorius, *Jinn. Fl. Fr Ind. III. 356*

THE SAFFLOWER, WILDER BASMAT SAFFLOW, AFRICAN SAFFLOW,
AMERICAN SAFFLOW, CARTHAMINE DYE, *Fl Fr*; CARAME
SAFFLAN KATARD, *Fr*, DYE SAFFLOW, *JAFFLOW* *ITAL*, *ITAL* *FR*

C. 637

The Safflower.

CARTHAMUS
tinctorius.

chiefly grown as subsidiary to some other crop, participating, therefore, in the treatment given to its associate. On this account it is extremely difficult to obtain trustworthy details as to the area under safflower, the method and cost of cultivation, nature of soil necessary, or value of the crop

(a) In Bengal it is chiefly grown in the Eastern division, where even still it constitutes a crop of some considerable value, although greatly decreased through the introduction of aniline dyes. In fact, the Indian safflower industry may be regarded as ruined, at least for the present, but similar fluctuations have occurred with other dye-stuffs, and it is quite possible the safflower trade may be resuscitated. Of Indian safflower, that from Dacca bears the highest reputation. It is there sown from the middle of October, and later sowings not till the beginning of December. The period of sowing varies slightly in different parts of Bengal. In Chittagong, for example, it is reported to be sown as late as January. Low churs are, as a rule, preferred, and especially where these are either new or have been left fallow for some years. The soil should be rich and deep, and the seed should be sown at a depth of about 1 inch. The plants are very tender, and require to be protected from frost. They are also very susceptible to drought, and require to be watered during the summer months. The plants are ready for harvest in about 100 days. The seed is then extracted by beating the plants, and the seed is then cleaned and pressed. The oil is then extracted by pressing the seed, and the oil is then refined. The oil is then used for various purposes, including as a lamp oil, and for medicinal purposes. The seed is also used for various purposes, including as a food source, and for medicinal purposes. The seed is also used for various purposes, including as a food source, and for medicinal purposes.

CULTIVATION.

BENGAL.
639
Sown
Oct. to Dec.

Gathered
March to May.

even till May. In removing the florets, the flower-heads are not much injured, and as they are removed, the seeds continue to mature, and are ripe in April. One seeded fruits, and are ripe in April. The seed is then extracted by beating the plants, and the seed is then cleaned and pressed. The oil is then extracted by pressing the seed, and the oil is then refined. The oil is then used for various purposes, including as a lamp oil, and for medicinal purposes. The seed is also used for various purposes, including as a food source, and for medicinal purposes.

(Agricultural Society of India, 1911)

As shown in the map, the area under safflower is

crop;

gram,

seed is

however,

under this crop in Bengal, but the following figures are quoted from Dr. McCann's work (which is taken from the official returns sent to the Economic Museum). Dacca, 11,500 acres, Gya, 2,260 acres; Monghur, 2,000 acres, Midnapur, 15,000 acres, all other districts about 2,000 acres.

Area.

N-W. P. AND
ODH,
640

(b) In the North West Provinces and Oudh, safflower is not so extensive.

the North-West Provinces is annually under safflower, and it has been computed that the total area under this crop is about 18,000 acres, of which

CARTHAMUS
tinctorius.

The Safflower.

CULTIVATION

Sown
Oct. to Nov.

Price.

BOMBAY.
641

Area.

Sown Oct.
gathered
March.

Production.

Varieties.
Sadhi.642
Kusambyachi.
643PANJAB.
644CENTRAL
PROVINCES.
645

Area.

38 per cent. is irrigated land. The mode of cultivation is very similar to what has already been described for Bengal. Light soils are preferred; the plant is rarely grown alone, but is generally sown in the gram fields and disposed like rape in lines. It is extensively grown along with carrots near wells, participating in the rich cultivation bestowed on the latter. It is also associated with cotton, wheat, or barley. In the North-West Provinces the sowings generally take place in October to November, so that the crop is obtained a little earlier than in Bengal.

"Lightning is popularly supposed to do great injury, if it occurs while the heads are in flower, and the plants are reported to suffer occasionally from the attacks of an insect known as the *di*, the scientific name and affinities of which have not been ascertained" (*Duthie and Fuller*). In a report on the dyes and processes of dyeing in Ajmir it is stated that about 20,000 maunds of safflower are annually received from Delhi, the best quality being valued at Rs 30 a maund and the inferior sort at Rs 24.

(c) In Bombay it is reported to be cultivated in Ahmedabad, Kaira, Surat, Nāsik, Khāndesh, Sholapur, and Broach. Lisboa says the cultivation "is very expensive and unremunerative if carried out by itself, it is, therefore, almost always grown as a subordinate crop along with barley, gram, &c., to which last the cultivator looks for his profits." Probably not more than 5,000 acres are annually under this crop in the whole of the

Nizam's dominions the prepared dye-stuff to the value of Rs 12,000 annually, nearly two-thirds of which is forwarded to Bombay; and he adds that

the crop is grown more for oil than for dye. In the Deccan two forms of the plant chiefly for yielding oil *kusumba* is for ten to cast at the

limited extent, and entirely as a local article, there being no export. It is sown in September and reaped in April. In the Delhi district there were, during the settlement, 288 acres under the crop, and in Hoshiārpur 6,722 acres, especially in the northern part of the Garhshankar *Tahsil*. It is generally grown as a mixed crop in lines with gram and requires a sandy soil. It is sown in September.

(e) In the Central Provinces, a little over 6,000 acres are annually under this *rabi* crop, and Raipur is stated to export the dye-stuff to about Rs 10,000 a year.

The brief notices given above regarding the safflower of Bengal, the North-West Provinces, Bombay, the Panjāb, and the Central Provinces, may be accepted as pretty nearly correct; but the official reports for the remaining provinces and Native States are either incomplete or quite incorrect, and it seems probable that not more than 10,000 acres are under this crop in the remaining provinces of India.

C. 645

The Safflower.

CARTHAMUS
tinctorius.

(f) In Berar, safflower, however, appears to be cultivated to a very considerable extent; Mr. Liotard informs us that the area under it is over 40,000 acres. This statement is compiled from official returns, but is obviously incorrect, since cultivation on so extensive a scale would indicate a very important trade, whereas we are informed that the dye-stuff is not exported. In the reports from the Nizam's territories, safflower seems to be an imported article, but this is at variance with the statement of the imports from His Highness's dominions into Ahmednagar.

(g) In Mysore and also in Madras it is cultivated very generally, but only in small patches, and there is no export trade.

(h) In the Prome district alone of Lower Burma there are said to be 260,000 acres annually under safflower. It is unnecessary to say this statement must be incorrect, since Burma has only a little over four million acres of arable land, of which three million acres are annually under rice. This remarkable agricultural peculiarity almost precludes an extensive cultivation of safflower, since rice-lands are not suitable for this crop, and besides, Burma, instead of exporting safflower, receives annually a small amount from the Straits Settlements.

CULTIVATED VARIETIES—It has already been stated that, according to Mr. O. B. Clarke, *Carthamus oxyacantha*—a wild plant in the Panjáb—may possibly be the source from which by cultivation *C. tinctorius* has been derived. It is frequently observed that plants, which in a wild state are very spiny, show a tendency to lose the spines under cultivation. This might account for some of the peculiarities of the cultivated plant (*C. tinctorius*), and there exists the curious fact in further support of this, that there are two distinct cultivated varieties met with in India—

(a) Very spiny form. This may be regarded as the typical condition. It is known as *kutela* in Patna and *kati* in Berar, and is supposed to give an inferior quality of dye. This is the *sadhi* or oil-yielding form of the Deccan alluded to above.

(b) Almost spineless form. This is known as *bhusli* in Patna, *bod-ki* in Berar, *murilia* (or shaved) in Azamghar and the *kusumbyachi* in the Deccan. A superior quality of dye is derived from this form.

—The average output estimated at Rs 15
to pay its share of

rent of land and expense of cultivation, as much as one-third of the earnings may be regarded as profit, but it is difficult to obtain trustworthy information regarding the profits from safflower cultivation, and it cannot pay now-a-days to cultivate it alone. Dr. McCann gives the profits in Bengal as from Rs 3 to Rs 15 a bigha.

PRESENT POSITION OF THE SAFFLOWER INDUSTRY.

Simmonds in his *Tropical Agriculture* says "The cultivation of safflower, known as *Coosumban* in Bengal, is receiving attention at the hands of the local Government. The prosperity of Bengal, though it mainly depends upon the jute trade, is in some measure attributable to the demand for safflower." The writer proceeds to state that the value of the exports from Dacca alone "would be from nine to ten lakhs of rupees—£90,000 to £100,000. The cultivation is said to be largely extending." Then follows "Safflower is grown, but to a limited extent, in Bengal, and does not grow promiscuously all over the district." Mr. Simmonds' work was published in 1882, and it is probable that from all India were only they were Rs 6,50,827, so established at the time N . . .

CULTIVATION
BERAR.
646

MYSOORE.
647
BURMA.
648

VARIETIES.

Spiny Form.
649

Spineless
Form
650

OUTTURN.

TRADE,
651

CARTHAGUS
linctorius

The Safflower.

CULTIVATION

Safflower is a hardy plant. It can be cultivated in any soil, but it is best suited to a light, sandy soil. It is a very hardy plant, and it can be cultivated in any soil, but it is best suited to a light, sandy soil. It is a very hardy plant, and it can be cultivated in any soil, but it is best suited to a light, sandy soil.

Sown
Oct. to Nov.

Price.

BOMBAY.
641

Area.

Sown Oct.
Raiders
Raiders

Production.

Varieties.
Saghi.Kuzambrachi.
643PANJAB.
644CENTRAL
PROVINCES.
645

Area.

"In the case of the safflower, the seed is very hard and it is best to soak it in water for a few days before sowing it. It is a very hardy plant, and it can be cultivated in any soil, but it is best suited to a light, sandy soil. It is a very hardy plant, and it can be cultivated in any soil, but it is best suited to a light, sandy soil.

"In the case of the safflower, the seed is very hard and it is best to soak it in water for a few days before sowing it. It is a very hardy plant, and it can be cultivated in any soil, but it is best suited to a light, sandy soil. It is a very hardy plant, and it can be cultivated in any soil, but it is best suited to a light, sandy soil.

"In the Panjab, safflower appears to be grown to a very limited extent, and entirely as a local article, there being no export. It is sown in September and reaped in April. In the Delhi district there were, during the settlement, 255 acres under the crop, and in Hoshiarpur 672 acres, especially in the northern part of the Gurdaspur Tahsil. It is generally grown as a mixed crop in lines with gram and requires a sandy soil. It is sown in September.

"In the Central Provinces, a little over 6,000 acres are annually under this *rubri* crop, and Raipur is stated to export the dye-stuff to about Rs 10,000 a year.

The brief notices given above regarding the safflower of Bengal, the North-West Provinces, Bombay, the Panjab, and the Central Provinces, may be accepted as pretty nearly correct; but the official reports for the remaining provinces and Native States are either incomplete or quite incorrect, and it seems probable that not more than 10,000 acres are under this crop in the remaining provinces of India.

The Safflower.

CARTHAMUS
tinctorius.

(f) In Berar, safflower, however, appears to be cultivated to a very considerable extent; Mr. Liotard informs us that the area under it is over 40,000 acres. This statement is compiled from official returns, but is obviously incorrect, since cultivation on so extensive a scale would indicate a very important trade, whereas we are informed that the dye-stuff is not exported. In the reports from the Nizam's territories, safflower

CULTIVA-
TION
BERAR.
646

260,000 acres annually under safflower. It is unnecessary to say this statement must be incorrect, since Burma has only a little over four million acres of arable land, of which three million acres are annually under rice

MYSORE.
647
BURMA.
648

amount from the Straits Settlements

CULTIVATED VARIETIES—It has already been stated that, according to Mr. O. B. Clarke, *Carthamus oxyacantha*—a wild plant in the Panjáb—may possibly be the source from which by cultivation *C. tinctorius* has been derived. It is frequently observed that plants, which in a wild state are very spiny, show a tendency to lose the spines under cultivation

VARIETIES.

give an inferior quality of dye. This is the *sadhi* or 'oil-yielding' form of the Deccan alluded to above.

Spiny Form.
649

(b) Almost spineless form. This is known as *bhuil* in Patna, *bod-ki* in Berar, *murilia* (or shaved) in Azamghar and the *kusumbyachi* in the Deccan. A superior quality of dye is derived from this form.

Spineless
Form
650

AVERAGE OUTTURN AND PROFIT OF CULTIVATION—The average outturn of safflower sown thickly amongst carrots has been estimated at R15 along with R5 for seed, and allowing the other crop to pay its share of the earnings, it cannot

OUTTURN.

Bengal as from R3 to R15 a *bigha*.

PRESENT POSITION OF THE SAFFLOWER INDUSTRY.

Simmonds in his *Tropical Agriculture* says. "The cultivation of safflower, known as *Coosumban* in Bengal, is receiving attention at the hands of the local Government. The prosperity of Bengal, though it mainly depends upon the jute trade, is in some measure attributable to the demand for safflower." The writer proceeds to state that the value of the exports from Dacca alone "would be from nine to ten lakhs of rupees—£90,000 to £100,000. The cultivation is said to be largely extending." Then follows "Safflower is grown, but to a limited extent,

TRADE,
651

CARTHAMUS
tinctorius.

The Safflower.

CULTIVATION

38 per cent is irrigated land. The mode of cultivation is very similar to what has already been described for Bengal. Light soils are preferred; the plant is rarely grown alone, but is generally sown in the gram fields and disposed like rape in lines. It is extensively grown along with carrots near wells, participating in the rich cultivation bestowed on the latter. It is also associated with cotton, wheat, or barley. In the North-West Provinces the sowings generally take place in October to November, so that the crop is obtained a little earlier than in Bengal.

"Lightning is popularly supposed to do great injury, if it occurs while the herds are in flower, and the plants are reported to suffer occasionally from the attacks of an insect known as the *al*, the scientific name and affinities of which have not been ascertained" (*Duthie and Fuller*). In a report on the dyes and processes of dyeing in Ajmir it is stated that about 20,000 maunds of safflower are annually received from Delhi, the best quality being valued at Rs 30 a maund and the inferior sort at Rs 24.

(c) In Bombay it is reported to be cultivated in Ahmedabad, Kaira, Surat, Nāsik, Khandesh, Sholapur, and Broach. Lisboa says the cultivation "is very expensive and unremunerative if carried out by itself, it is, therefore, almost always grown as a subordinate crop along with barley, gram, &c., to which last the cultivator looks for his profits." Probably not more than 5,000 acres are annually under this crop in the whole of the Bombay Presidency. A considerable trade is done in Ahmednagar, where the plant is sown in strips along with millets, wheat, and other crops, the seed being put into the ground in October and the crop of flowers collected in March. Mr. Liotard states that the town of Nagar imports from the Nizam's dominions the prepared dye-stuff to the value of Rs 12,000 annually, nearly two-thirds of which is forwarded to Bombay, and he adds that the neighbourhood produces about Rs 8,000 worth of the dye. In Kaira it is stated that 41,134 maunds are annually produced, of which 25,600 maunds are used up locally. The official reports from Bombay state, however, that the crop is grown more for oil than for dye. In the Deccan two forms of the plant are grown—*sādhi*, a strong plant with thorny leaves grown chiefly for its oil-seeds, *kusumbyachi*, a slenderer plant grown for its dye-yielding flowers (*Bomb Gaz*, XII, 164). In Gujrat the "*kabri*" or *kusumba* is grown both in *goradu* and black soil. The land is ploughed for ten to twenty times before the sowing. The seed is sown broadcast at the rate of 10 lb to the *bigha* and is reaped in February. The average yield is in seed 400 lb and in flowers 80 lb" (*Bomb Gaz*, VII, 97). Bombay safflower is commercially much inferior to that from Bengal.

(d) In the Panjab, safflower appears to be grown to a very limited extent, and entirely as a local article, there being no export. It is sown in September and reaped in April. In the Delhi district there were, during the settlement, 288 acres under the crop, and in Hoshiarpur 6,722 acres, especially in the northern part of the Garhshankar Tahsil. It is generally grown as a mixed crop in lines with gram and requires a sandy soil. It is sown in September.

(e) In the Central Provinces, a little over 6,000 acres are annually under this *rabi* crop, and Raipur is stated to export the dye-stuff to about Rs 10,000 a year.

The brief notices given above regarding the safflower of Bengal, the North-West Provinces, Bombay, the Panjab, and the Central Provinces, may be accepted as pretty nearly correct, but the official reports for the remaining provinces and Native States are either incomplete or quite incorrect, and it seems probable that not more than 10,000 acres are under this crop in the remaining provinces of India.

C. 645

Sown
Oct. to Nov.

Price.

BOMBAY.
641

Area.

Sown Oct.,
gathered
March

Production.

Varieties.
Sādhi.
642Kusumbyachi.
643PANJAB
644CENTRAL
PROVINCES
645

Area

The Safflower.

CARTHAMUS
tinctorius

(f) In Berar, safflower, however, appears to be cultivated to a very considerable extent; Mr. Llotard informs us that the area under it is over 40,000 acres. This statement is compiled from official returns, but is obviously incorrect, since cultivation on so extensive a scale would indicate a very important trade, whereas we are informed that the dye-stuff is not exported. In the reports from the Nizam's territories, safflower seems to be an imported article, but this is at variance with the statement of the imports from His Highness's dominions into Ahmednagar.

(g) In Mysore and also in Madras it is cultivated very generally, but only in small patches, and there is no export trade.

(h) In the Prome district alone of Lower Burma there are said to be 260,000 acres annually under safflower. It is unnecessary to say this statement must be incorrect, since Burma has only a little over four million acres of arable land, of which three million acres are annually under rice.

CULTIVA-
TION
BERAR.
646

MYSORE.
647
BURMA.
648

amount from the Straits Settlements

CULTIVATED VARIETIES—It has already been stated that, according to Mr. C. B. Clarke, *Carthamus oxyacantha*—a wild plant in the Panjab—may possibly be the source from which by cultivation *C. tinctorius* has been derived. It is frequently observed that plants, which in a wild state are very spiny, show a tendency to lose the spines under cultivation. This might account for some of the peculiarities of the cultivated plant (*C. tinctorius*), and there exists the curious fact in further support of this, that there are two distinct cultivated varieties met with in India—

(a) Very spiny form. This may be regarded as the typical condition. It is known as *kutela* in Patna and *kati* in Berar, and is supposed to give an inferior quality of dye. This is the *sadhi* or oil-yielding form of the Deccan alluded to above.

(b) Almost spineless form. This is known as *bhuuli* in Patna, *bod-ki* in Berar, *murilia* (or shaved) in Azamghar and the *kusumbyachi* in the Deccan. A superior quality of dye is derived from this form.

VARIETIES.

Spiny Form.
649

Spineless
Form
650
CULTURN.

information regarding the profits from safflower cultivation, and it cannot pay now-a-days to cultivate it alone. Dr. McCann gives the profits in Bengal as from Rs 3 to Rs 15 a bigha.

PRESENT POSITION OF THE SAFFLOWER INDUSTRY.

Simmonds in his *Tropical Agriculture* says: "The cultivation of safflower, known as *Coosumban* in Bengal, is receiving attention at the hands of the local Government. The prosperity of Bengal, though it mainly depends upon the jute trade, is in some measure attributable to the demand for safflower." The writer proceeds to state that the value of the exports from Dacca alone "would be from nine to ten lakhs of rupees—£90,000 to £100,000. The cultivation is said to be largely extending." Then follows "Safflower is grown, but to a limited extent, in Bengal, and does not grow promiscuously all over the district." Mr. Simmonds' work from all India were they were Rs 6,50, established at the

TRADE,
651

CARTHAMUS
tinctorius.

The Safflower.

TRADE.

ing." The total exports for 1886-87 were only Rs3,819. The following table gives the exports from India for the past fourteen years:—

Exports.			
YEAR.	SAFFLOWER.		
	Quantity.	Value.	
	Mds.	Rs.	
1873-74	13,206	2,58,906	
1874-75	14,222	6,50,827	
1875-76	4,030	1,63,528	
1876-77	7,662	3,04,672	
1877-78	3,698	1,48,806	
1878-79	4,977	1,56,711	
1879-80	2,411	1,81,456	
1880-81	5,675	3,51,157	
1881-82	2,293	94,754	
1882-83	3,008	92,038	
1883-84	2,333	64,492	
1884-85	2,167	83,083	
1885-86	1,898	68,991	
1886-87	2,140	83,819	

in India has been steadily may now be pronounced aniline dyes both as an Duncan Bros. & Co. under safflower cultivation in

600 maunds of Indian, and of "

THE DYE.

DYE.
652
Preparation.

dried in the shade are generally sold for the home market, powdered and sifted. The first and last harvests are always inferior to those gathered in the middle of the season. In the former case many undeveloped florets are collected, and in the latter the plant is becoming exhausted and does not produce such brilliant colours. Care in the preparation and preservation of the dye-stuff exercises a most important influence over the quality, but the produce of one district is often much superior to another—a fact accountable for either by the more favourable nature of the soil or the care bestowed in cultivation. If intended for export, after having been dried as above, the florets are either placed in a bag or on a basket or other contrivance, permitting of the easy escape of a supply of water which is kept poured on them while beaten or trodden on. This process is continued until the water passes through quite clear. It is bright yellow, because of the soluble yellow colour matter which is left behind. The quality of the yellow is improved until

Yellow.
653
Red.
654

The Safflower.

CARTHAMUS
tinctorius.

they are quite freed from the yellow colour. River water (if clean) is regarded as preferable to tank water, but the presence of mud or other impurities in the water is most detrimental. The red colouring matter is completely soluble in dilute alkaline solutions, and care must be taken that the water used does not contain soluble alkaline salts; in fact, to be safe it should be slightly acidulated, otherwise a large proportion of the red colour may be removed during the process of washing away the yellow pigment. The tramping or kneading is continued at intervals for three or four days, the mass being allowed to get dry between the washings. To ascertain if all the yellow colour has been removed a small quantity is thrown into a basin of clean water, if it does not impart yellow colour, the dyestuff has been sufficiently washed. The pulpy mass is now squeezed between the hands into small, flat, round cakes, like biscuits; or it is sometimes, though less frequently, made into balls. These are known in the trade as "Stripped Safflower." When the cakes or balls have been carefully dried, they are ready for the market.

The *Gazetteer* for the district of Karnal in the Panjab describes the process generally followed in that province, in which apparently the flowers are linked into cakes without removing the stems &c. "When the flowers open, the women pick out the petals; three days later they repeat the operation; and again a third time after the same interval. If dried they take a quarter of the picking as the flowers. The petals are laid for the same day in a mortar, rolled between the hands, and squeezed tight into a cake. Next day they are rolled again, and then spread in the sun for two days to dry, or still better one day in the sun and two days in the shade. One seer of petals will give a quarter of a seer of dye. Any delay in the preparation injures the dye." The process is very different from that pursued in Bengal and other parts of India that it may be accepted as accounting for the lower price of a safflower than that of a rose.

Mr. J. G. French, writing of Dyestuffs in *Bureau of the American Horticultural Society's Journal* for 1891, remarks "Safflower is said to have been formerly grown extensively in the eastern states, where the product is really good, while their valuable properties are unknown, they were then the unknown as now. The safflower is a hardy plant, and would seem to be a native of the United States, where it is said to have been introduced from the East, and the very excellent dye which it produces, is said to be the most valuable of the group of the plant. The safflower is a hardy plant, and would seem to be a native of the United States, where it is said to have been introduced from the East, and the very excellent dye which it produces, is said to be the most valuable of the group of the plant."

Admiration of Safflower Cakes and Test for Purity.—The safflower cakes are of a deep red colour, and are used for dyeing. The safflower is a hardy plant, and would seem to be a native of the United States, where it is said to have been introduced from the East, and the very excellent dye which it produces, is said to be the most valuable of the group of the plant. The safflower is a hardy plant, and would seem to be a native of the United States, where it is said to have been introduced from the East, and the very excellent dye which it produces, is said to be the most valuable of the group of the plant.

DYE.

National
Safflower,
655Section of
Safflower,
655Safflower,
655Safflower,
655Safflower,
655Safflower,
655Safflower,
655Safflower,
655

CARTHAMUS
tinctorius.

The Safflower.

DYE.

Estimation of
Quality.
661Two yellows
and one red.

Carthamin.

EUROPEAN
DYE
SOLUTIONS.
663

The quality of safflower cake is estimated by dyeing a known weight of cotton; about 4 ounces of safflower will dye 1 lb of cotton cloth light pink; 8 ounces will dye it full rose-pink; and from 12 ounces to 1 lb will dye it a full crimson. In order to take up this quantity, the cotton must be several times dyed in fresh solutions of the colouring matter.

Chemical History.—It is scarcely necessary to go into great detail regarding this, now almost unimportant, product. It has already been stated that the florets contain two colouring principles, or, to be more correct,

Car-
th, the
forth-
26 to

36 per cent. of the florets, while from 0.3 to 0.6 per cent. is the usual amount of Carthamin. The proportion of Carthamin present varies, however, in the inverse ratio to the amount of the soluble yellow principle. The second yellow colour is soluble only in an alkaline liquor.

If the dye-stuff, after the removal of the soluble yellow principle, be acidulated with acetic acid, filtered, and first acetate of lead and next

solubility in pure or acidulated water. The alkali in most frequent use is carbonate of soda (or ordinary washing soda, 15 per cent. to the weight of the florets). In India pearl-ash is most frequently used, especially that prepared by incinerating *bayra* (*Penicillaria spicata*) or of *chur chira* (*Achyranthes aspera*), (impure potassium carbonates), but the natural earth carbonate of soda or *saff-mâli* is also frequently employed for this purpose.

EUROPEAN DYE SOLUTIONS.

Preparation of Dye Solution and European Methods of Dyeing with

the carthaminic acid from these foreign substances, but this result is very readily brought about by immersing into the alkaline solutions, previous to the addition of an acid, a quantity of cotton-wool. This material attracts, by special action, the carthaminic acid at the moment it is set free by the addition of an acid; and cotton-wool may first be washed in a weak acid, and next in water, and, lastly, again with a weak alkaline liquid, which re-dissolves the carthamin. After removal of the cotton-wool, plenty of which should be used, it is re-precipitated by an acid, very dilute citric or tartaric being the best. It falls down in the state of a beautifully rose-red flocculent matter, which may be collected on a filter, washed, and dried. In order to obtain a still purer material, the flocculent dry substance is washed with water, and the solution, after having been filtered, is again acidulated with acetic acid, and the carthaminic acid is again precipitated. Care should be taken not to let the solution become too acid, nor should the solution be allowed to stand for a long time, as it completely alters the colouring matter.

The Safflower.

CARTHAMUS
tinctorius.

DYE.

"Carthamin in a pasty state, as obtained by the process just described, is met with in commerce suspended in water for direct use. The paste is dried upon suitable vessels—porcelain saucers, plates, or even upon polished cardboard

acid, this, while of course not so accurate as that given above, is nevertheless the mode pursued where absolute purity is not necessary. The following passage may prove useful to Indian dyers or persons interested in the safflower industry: "Carthamus from which the yellow matter has been extracted, and whose lumps have been broken down, is put into a trough. It is repeatedly sprinkled with crude pearl-ash or soda, well pow-

long as it is perceived to take up the colour. For *ponceau* (poppy-colour) it is withdrawn, the liquor is run out of it upon the peg, and it is turned through a new bath, where it is treated as in the first. After this it is dried and passed through fresh baths, continuing to wash and dry it between each operation, till it has acquired the depth of colour that is desired. When it has reached the proper point, a brightening is given it by turning round the sticks seven or eight times in a bath of hot water, to which about half a pint of lemon-juice for each pailful of water has been added.

"When silk is to be dyed *ponceau* or poppy-colour, it must be previously boiled as for white, it must then receive a slight foundation of *arnatto*. The silk should not be alumed. The *nacarat* and the deep cherry-colour are given precisely like the *ponceaux*, only they receive no *arnatto* ground, and baths may be employed which have served for the *ponceau*, so as to complete their exhaustion. Fresh baths are not made for the latter colours, unless there be no occasion for the poppy.

"With regard to the lighter cherry reds, rose-colour of all shades, and flesh colours, they are made with the second and last runnings of the carthamus, which are weaker. The deepest shades are passed through first.

"The lightest of all these shades, which is an extremely delicate flesh-colour, requires a little soap to be put into the bath. This soap lightens the colour, and prevents it from taking too speedily and becoming uneven. The silk is then washed, and a little brightening is given it in a bath which has served for the deeper colours.

"All these baths are employed the moment they are made, or as speedily as possible, because they lose much of their colour upon keeping, by which they are even entirely destroyed at the end of a certain time. They are, moreover, used cold, to prevent the colour from being injured. It

CARTHAMUS
tinctorius.

The Safflower.

DEY.

must have been remarked, in the experiments just described, that caustic alkalis attack the extremely delicate colour of carthamus, making it pass to yellow. This is the reason why crystals of soda are preferred to other alkaline matters.

"In order to diminish the expense of carthamus, it is the practice in preparing the deeper shades to mingle with the first and the second bath about one-fifth of the bath of archil" (*Ure's Dict of Arts, Man., and Mines, Vol. I, 661*)

INDIAN DYE
SOLUTIONS.
664

INDIAN DYE SOLUTIONS.

Indian Method of dyeing with Safflower.—As already stated, the method adopted in India is in theory identical with the European, but as practised it is crude, giving much inferior results when compared with the delicate shades prepared in Europe from this dye. The separation of the carthamic acid from mechanical impurities by precipitating it on cotton-wool and again dissolving off this pure dye by means of an alkali, does not appear to be known to the natives of India. The dye stuff, after the removal of the yellow colour, is rubbed up, by the hand, with the pearl-ash, and thereafter strained through a cloth. The first straining is regarded as the best, and is reserved for giving the final shade in dyeing, but the process of rubbing up with an alkaline solution and straining is repeated three or four times, until no more colour can be extracted. No mordant is required when dyeing with safflower, but it is a common practice in India to dye the fabric first with the yellow liquid, then with the last straining of carthamin, and so on until, when depth of colour is required, the first straining is used to give the final immersion. Before the fabric is dipped in the carthamic liquid, however, a dilute acid is added in order to precipitate the red carthamic acid. This fine powder remains for a considerable time minutely diffused through the liquid, instead of subsiding to the bottom. It has no actual chemical affinity for fibres, but when a fabric is dipped in the red liquid, the fine powder is rapidly precipitated within the fabric, producing the well known and brilliant shades of orange, pink, and even dark red. The acid used is generally lime-juice in the proportion of about 1lb of lime-juice to 2lb of dye solution. Sometimes the juice of the tamarind is employed in place of lime-juice. In Mánipur the fruits of *Garcinia pedunculata* are viewed as superior to lime juice, and have the reputation of rendering the colour less fleeting.

Combinations.
665

Indian Dye Combinations.—Different depths of red colour are generally obtained either by longer immersion in the dye solution or by frequent repetitions in fresh solutions. Shades of orange are generally produced either by dyeing the fabric first with the yellow soluble colour (in some parts of Bengal known as *peworree* water, according to McCann, a name which, if actually applied, must be carefully distinguished from the yellow urine dye or *puri* or *puri rung*). Instead of the safflower yellow, a ground colour may be given with turmeric or any other yellow dye, when different shades of orange or *nārangi* will be obtained, so also combinations with *arnatto*, *kamala*, and *harsinghar*, the shades of orange passing into pink. Red is produced by three immersions in safflower dye, the 3rd straining, 2nd straining, and last of all the 1st straining, the cloth being allowed to dry between each, and finally washed out with turmeric. This is known in Farukhabad as *gulanār*, if instead of turmeric indigo be used, a magenta colour is produced, the *gulabbasi* of Agra. The *saffar* pink of Cawnpore is produced with *harsinghar* and safflower, the latter being weak if concentrated, orange or the *nārangi* of Etawah is the result, and a more yellow orange, *safrāni*, is produced, when the cloth is first dyed with *harsinghar* and afterwards with safflower. (*Buck's Dyes and Tans of*

The Safflower.

CARTHAMUS
tinctorius.

N.-W P) With *Terminalia Chebula* or *T. citrina* and protosulphate of iron, safflower gives a dark neutral tint, with safflower, sappanwood, and alum a purplish brown; and with indigo and safflower, greens and purples (*McCann, Dyes and Tans of Beng*)

An almost indefinite series of colours are obtained in India by various combinations with safflower. It should be carefully observed, however,

DYE.

Use of acids
and alkalis.
666

peculiarly be fully appreciated, otherwise the observer cannot give an

667

FIXING
668

ent parts of India boast of possessing a secret of effecting this purpose, and careful observation on the part of local officers may help to throw some light on the subject. All that is necessary to re-establish the carthamine dye as an important industry is the discovery of some mode of preventing this oxidation of carthamin. The fruit of *Garcinia pedunculata*, a common tree in Assam, has already been alluded to. Although there would not appear to be much hope of finding the property attributed to this fruit confirmed on careful examination, its extensive use as a dye auxiliary by most of the hill tribes of Assam certainly justifies this matter receiving careful attention. Dr. McCann informs us that the dyers of Chittagong distinct claim to be able to produce a "semi-permanent" safflower dye. This is done by adding safflower to water in which tamarinds and the ashes of burnt plantain rinds have been well soaked. The principle here employed is the mixing of the acid and alkali together, instead of first extracting the dye with an alkali and precipitating the carthamin with an acid upon the fabric. In some parts of India the pearl-ash and lime-juice are mixed together, and the liquid thus prepared is used to extract the carthamic acid direct. It is difficult to understand this

Safflower dyed fabrics should not be washed with soap, as the colour is removed by the alkali of the soap.

Rouge.—It is necessary to refer here very briefly to an important purpose for which safflower is employed, viz, the manufacture of rouge.

ROUGE.
669

The Safflower.

ARTHAMUS
tinctorius.

upper inverted vessel is found to be about half full of the charred seed, and the lower one, which was imbedded in the ground, about one-third full of a black substance charred, but the preservation of leather worth the while of this kind of oil was oil by this process (R. W. Bingham).

OIL.

THE MEDICINE.

MEDICINE.

"This plant is the *kutumbhu* of Sanskrit writers, who describe the seeds as purgative, and mention a medicated oil which is prepared

OIL.
673

"A fixed oil is prepared from it which the Egyptians used as an external remedy for ulcers; for which it is put into an annular form of the seeds (a, I., 72). It is also used in Egypt, and Jamaica, the flowers are much used for colouring broths and ragouts.

Flowers.
674
Seeds.
675

resemble in colour, but from which they may be distinguished by their tubular form, and the yellowish style and filaments which they enclose. In large doses *arthamus* is said to be laxative; and administered in warm infusion, diaphoretic. It is used in domestic practice as a substitute for saffron in measles, scarlatina, and other exanthematous diseases to promote the eruption. An infusion, made in the proportion of two drachms to a pint of boiling water, is usually employed, and given without restriction as to quantity" (U. S. Dispensary).

OIL.
677

"The seeds are said to have properties like linseed, and to be useful in unhealthy ulcers" (U. C. Dutta, Civil Medical Officer, Serampore). "Decoction used as a diuretic. The seeds are laxative. The oil is used as a dressing for ulcers" (U. S. Dispensary).

Decoction.
678

an article of food. The roasted seeds are eaten; they were much procured by well-to-do people during the late famine at Sholapur. The cake is excellent for fattening poultry" (Lisboa, U. S. Pl., Bomb., 163). Safflower is sometimes used to dye cakes, biscuits, and toys, but as it is purgative it should not be too freely employed for this purpose.

FOOD.
Seeds.
679
Leaves.
680

The Caraway.

CARUM
Carui.

CONDIMENT.

oriental origin since such a name might simply mean that in that part of the country it was first brought to the attention of the natives by the Europeans. Indeed, the facilities of trade offered by the Persian Gulf can easily be understood to have made the people of Bombay more familiar with an imported article than with a wild or even cultivated plant of the Panjáb Himálaya. Authors are about equally divided in the restriction of the word *sira* to Carum Carui on the one hand, and to Cumum Cymnum on the other (Conf. with C. nigrum).

Great Britain are about 20,000 cwts a year and chiefly from Holland. It is also largely grown in Kent and Essex.

Oil.—A valuable essential oil is obtained from the seeds, called Caraway Oil. This oil is colourless or pale yellow, thin, with a strong odour and flavour of the fruit. It is used in medicine and more extensively as a perfume for soaps. (*Spons'*)

TRADE.
683OIL.
684PERFUMERY.
685

Medicine.—As a medicine the dried fruit possesses stimulant and carminative properties. It has been found useful in flatulent colic, atonic dyspepsia, and spasmodic affections of the bowels. Two preparations are given in the *Pharmacopæia of India, viz*, Oil of Caraway and Caraway

MEDICINE.
686

water

"Muhammadan writers describe the fruits as aromatic, carminative, and astringent, from them they prepare an eye-ash which is supposed to strengthen the sight, they are also used as a pectoral, and considered diuretic and anthelmintic. A caraway bath is recommended for painful swelling of the womb, and a poultice for painful and protruding piles" (*Dymock's Mat. Med. IV. Ind., 304*).

Fruit
687

Chemical Composition.—"Caraways contain a volatile oil, which the Dutch drug affords to the extent of 5.5 per cent, that grown in Germany to the amount of 7 per cent, in Norway 5.8 per cent have also been obtained from the indigenous caraways. The position and size of the vitæ account for the fact that comminution of the fruits previous to distillation does not increase the yield of oil.

CHEMISTRY.
688

"Volckel (1840) showed that the oil is a mixture of a hydrocarbon $C_{10}H_{16}$ and an oxygenated oil, $C_{10}H_{14}O$. Berzelius subsequently termed the former *carvene* and the latter *carvol*.

and
has t

gyrate power, that of carvene being considerably the stronger; there are probably not many liquids exhibiting a stronger dextrogyrate rotation. Carvene is of a weaker odour than carvol, from which it has not yet been absolutely deprived, perfectly pure carvene would no doubt prove no longer to possess the specific odour of the drug. By distilling it over sodium, it acquires a rather pleasant odour, its specific gravity at 15° C. is equal to 0.861.

C. 688

CARUM
copticum.

The Bishop's Weed.

CHEMISTRY

"Carvol at 20° C" - "C" , the same oil appears to the same percent constitut however,

If four parts of Carvol, either mixed with one part of alcohol, sulphuretted hydrogen, crystals is soon as a little ammonia is

added. (Pharmacog)

Special Opinions—§ "Stimulant and laxative. The white variety is lactagogue" (Assistant Surgeon Nehal Singh, Saharanpore) "Have used it to increase the flow of milk with no decided effect" (Surgeon D Picachy, Purneah.)

FOOD
Seed
689
Roots
690

Food—The seed is used parched and powdered, or raw and entire. In the former case it is employed to flavour curries, in the latter it is put in cakes. It is used in confectionery and in flavouring drinks. It also "produces a spirit cordial" (Morton). The roots of the caraway plant are very agreeable and are much eaten in the north of Europe (O'Shaughnessy).

Special Opinions—§ "As a condiment with curries" (Surgeon C M Russell, M D, Sarun) "Carminative, largely used in curry powder" (Assistant Surgeon Shub Chunder Bhattacharyj, Chanda, Central Provinces).

691

Carum copticum, Benth, Fl Br. Ind, II, 682, Wight, Ic, t 566.

THE BISHOP'S WEED, LOVAGE, AJAVA SEEDS, AMYZAD, Dutch, SISON, Fr, AMEOS, Port

Syn—AMMI COPTICUM, Boiss, LIGUSTICUM AJAWAIN, Fleming, L AJOUAN, Roxb, PTYCHOTIS COPTICA, DC F AJOWAN, DC SISON AMMI, Jacq, BUNIUM AROMATICUM, Linn

Vern—Ajoan, ajwain, Hind Jowan, jwani, BEND, Ajamo, Guj, Chohara, Cutch, Owa, Mar, Jawind, KASHMIR, Aman, aman, ...

Re

161, 223 Spens Encycl, 791, Smu, Dru, 1, 100, 5, Top Ajmir, 124, Kew Cat, 74

Habitat—Cultivated extensively in India on account of its seeds, from the Panjab and Bengal to the South Deccan. This seems to be the *ajmi* of the Greeks. It is first mentioned in Europe as brought from Egypt about 1549 and had come into medical use in London about 1693, since it is mentioned by Dale.

Oil—The seeds yield an oil on distillation with water, which is used ...

OIL
692
MEDICINE
693

is are much valued for their native properties. "They are y of capsicum or mustard with spasmodic virtues of asafoetida"

CARYOPHYLLUS
aromaticus.

Cloves.

MEDICINE.
702

He is a . . . throughout India, . . . vomiting, and . . . and stimulant

FOOD.
Seeds.
703
Leaves.
704

native cookery, and is given by
Shib Chunder Bhattacharys, Chanda, Central Provinces.

705

Carving, Fancy work, Images, &c.—

Timbers used for :—

Berberis nepalensis, Spreng. (useful for inlaying)
Buxus sempervirens, Linn. (carving)
Cedrela Toona, Roxb. (carving)
Celastrus spinosus, Royle (carving and engraving)
Chickrassia tabularis, Adr Juss (carving)
Cocos nucifera, Linn. (fancy work)
Crataeva religiosa, Forst. (models)
Cupressus torulosa, Don (images)
Dalbergia cultrata, Grah. (carving)
D. latifolia, Roxb. (carving and fancy work).
D. Sissoo, Roxb. (carved work)
Diospyros Ebenum, Koenig. (used for inlaying).
D. melanoxylon, Roxb. (fancy work and carving)
Ecorymus grandiflorus, Wall. (carving).
E. Hamiltonianus, Wall. (carving into spoons).
Givotia rottileniformis, Griff. (carving figures).

Gmelina arborea, Roxb. (carving
 images)
Hardwickia binata, Roxb. (orna-
 mental work).
Holarrhena antidysenterica, Wall.
 (carvings).
Kydia calycina, Roxb (carving).
Melia Azadirachta, Linn. (idols).
Pistacia Integerrima, F L. Stuart
 (carving, ornamental work)
Premna tomentosa, Willd. (fancy
 work)
Santalum album, Linn. (carving).
Stephegyne parvifolia, Korth. (car-
 ved articles).
Symplocos cratægoides, Ham (car-
 vings).
Wrightia tinctoria, R. Br. (carving).
W. tomentosa, Rom. & Sch. (carved
 work).

CARYOPHYLLUS, Linn.: *Gen Pl.*, I., 719.

706

Carvophyllus aromaticus, Linn.: DC. Prodr., III., 262;

CLOVES

[MYRTACEÆ.

Syn.—*FLEGENIA CARYOPHYLLATA*, Thunberg.

Vern.—*Slakah* PERAK; *Launga*, *langa*, *BRUN*; *Lóng*, *laung*, *HIND*
Laung, *Isanful*, *PA*; *Laung*, *KASHMIR*, *Latanga*, *latunga*, *WARR*,
GUJ; *Latang*, *BOMA*; *Aramber*, *Arémbo*, *latangop-pu*, *Korup-pu*,
Arémbo, *TAM*; *Latangulu*, *Tel.*; *Chani*, *Mal.*; *Labang*, *Dec.*;
Latanga, *Siam*; *Aravala*, *SING*.

References.—Roth, *Fl. Ind.*, *Fl. C. B. C.*, 411, Kurr., For *Fl. Burm.*, 1, 11; *Gamble Man. Tim.*, 123, DC *Origin of Cult. Pl.*, 123; *Pharm.*, 1, 81, *Fl. & Herb. Pharmacog.*, 200; *U. S. Dispens.*, 15th Ed., 31, *Lenz & Trum.*, *Med. Pl.*, 112, *Ainslie*, *Mal. Ind.*, 1, 1.

Cloves.

CARYOPHYLLUS
aromaticus.

593, *U C Dutt, Mat Med Hind*, 164, 307; *Dymock, Mat Med IV Ind*, 2nd Ed, 328, *O'Shaughnessy, Beng Dispens*, 334, *Murray, Pl and Drugs of Sind*, 192, *Baden Powell, Pb Pr*, 349, *Waring, Basar Med*, 44, *S Arjun, Bomb Drugs*, 56, *Birdwood, Bomb Pr*, 35, *Lisboa, U Pl of Ec*, 34, *Spons, Encyclop*, 1807
Treasury of Botany, Ajmir

Habitat — A native of the Molu.

The Dutch tried to restrict its cultivation to the Island of Amboyna, but in the course of time it got introduced into India and other tropical countries. The flower-buds of this plant yield the cloves of commerce.

Cultivation and yield — "In cultivating cloves, the mother-cloves (fruits) CULTIVATION.

in the 12th year, when the average annual produce may be estimated at 6.7lb of marketable fruit from each tree. There is usually a crop every year, but in Sumatra the trees often bear only twice in 3 years. When past its prime, the tree has a ragged appearance. Its existence in Sumatra is supposed to be limited to a duration of about 20 years, except in very superior soil, where it may bear for 30 years. It does not bear till the 3 years. Hence, old trees have all to throughout it very desirable winds.

The harvesting of the flower buds (cloves) commences immediately they assume a bright red colour. The best and most usual plan is to pluck them singly by hand, and to be careful in taking the operation in the case of it, however, they are beaten off by long spread below. The plucked cloves and confers a brown hue, and prepares them for packing. In Sumatra, simple exposure to the sun for several days on mats is the common method, but elsewhere they are occasionally also smoked on hurdles covered with matting near a slow wood fire, and very rarely they are scalded in hot water before smoking. They are ready for packing when they break easily between the fingers." (*Spons' Encycl*)

Oil — Every part of the plant abounds with aromatic oil. The flower-buds and flower-stalks of cloves yield, when distilled with water, an essential oil. The process of distillation is largely carried on in England. It is a colourless or a yellowish oil, having a powerful odour and flavour of cloves. It easily combines with grease, soap, and spirit, and is extensively made use of in the manufacture of perfumery. In Germany it is often adulterated with carbolic acid. The essence of cloves is obtained by dissolving oil of cloves in the proportion of four ounces of oil to one gallon of spirit.

Description of the Drug — "The varieties of cloves occurring in commerce do not exhibit any structural differences. Inferior kinds are distinguished by being less plump, less bright in tint, and less rich in essential oil. In London price-currents, cloves are enumerated in the order of value thus: Penang, Bencoolen, Amboyna, Zanzibar" (*Pharmacog*, 284). The cloves met with in the Indian bazars are generally old and worthless. Those suited for medical use should have a strong, fragrant odour, a bitter,

OIL.
707

CARYOPHYLLUS
aromaticus.

Cloves.

DESCRIPTION
OF THE
DRUG

spicy, pungent taste, and it should emit a trace of it when pressed with the nail (*Waring's Basis*). They were introduced into commerce in imitation of true cloves. Cloves are soaked in a solution of true cloves. Cloves are largely shipped from Zanzibar, and used in the manufacture of mixed spice and for adulterating ground cloves. Molleer cloves or fruits are also exported probably for a similar purpose (*Spons' Factet*, 1868).

MEDICINE.
Buds
708

They are the flower-buds which constitute the cloves of commerce. They are used in tonic of pregnancy one drachm of in the dose of five grains. A five grain pill made of equal parts of pulp and powdered cloves generally opens the bowels. Cloves are much used in Hindu medicine, as an aromatic adjunct. They are regarded as light, cooling, stomachic and digestive, and useful. An infusion of cloves is given to the sick (*Hind*, 164). A mixture of equal parts of cloves and rectified spirits has an excellent effect in debility, loss of appetite, and in convalescence after fevers. Cloves are used externally in rheumatic pains, headache, and as a frequent ingredient of pills.

considered applied externally, and perfuming the breath. They have a tonic, and digestive qualities. They have a local effect that one mile clove eaten daily will prevent conception (*My*, 100). *Mat Med Ind*, 329).

Chemical Composition—"Few plants possess any organ so rich in essential oil as the drug under consideration. The oil known in pharmacy as *Oleum Caryophylli*, which is the important constituent of cloves, is obtainable to the extent of 16 to 20 per cent. But to extract the whole the distillation is continued the water being returned to the same material.

"The oil of cloves, sp gr 1.036 to 1.055, is a colorless, invariable pure oil, and comes over in the first period of distillation. The oil of cloves, $C_{15}H_{11}$, a sp gr of 0.918, and boils at $251^{\circ}C$. It is not colored on addition of ferric chloride, it is of a rather terebinthineaceous odour.

The oil of cloves, at 1.087 at $0^{\circ}C$, the melting point is 247.5° . It is a solid, crystallizable salt, and the crude oil of cloves is the eugenol, it will be obtained on addition of an acid and again distilling.

Eugenol is devoid of rotatory power, whence the crude oil of cloves, of which eugenol is by far the prevailing constituent, is optically almost inactive. The constitution of eugenol is given by the formula $C_{15}H_{11}$, $\left\{ \begin{array}{l} OCH_3 \\ OH \\ CH-CH-CH_3 \end{array} \right\}$ It belongs

CARYOTA
urens.

Sago Palm.

TRADE.

Imports for 1884 85

Presidency to which imported	Quantity	Value	Country from which imported	Quantity	Value.
	lb	R		lb	R
Bombay . . .	4,598,419	10,50,680	Zanzibar . . .	4,776,842	11,05,877
Bengal . . .	190,526	58,283	Aden . . .	11,767	2,908
British Burma . . .	1,283	425	Other Countries . . .	2,397	1,056
Madras . . .	773	453			
TOTAL . . .	4,791,006	11,09,841	TOTAL . . .	4,791,006	11,09,841

Exports for 1884 85

Presidency from which exported.	Quantity	Value	Country to which exported.	Quantity.	Value.
	lb	R		lb	R
Bombay . . .	1,618,465	3,55,692	United Kingdom . . .	1,112,224	2,32,739
Bengal . . .	29,105	10,090	China—Hongkong . . .	349,698	84,966
Madras . . .	1,390	1,462	Straits . . .	124,101	33,543
Sind . . .	20	5	Turkey in Asia . . .	15,137	3,887
			Aden . . .	7,000	1,790
			France . . .	7,000	1,750
			Other Countries . . .	33,880	8,574
TOTAL . . .	1,649,040	3,67,249	TOTAL . . .	1,649,040	3,67,249

Very little can be said regarding the present position of the new industry of cultivating cloves in South India. Good samples were, however, shown at the Colonial and Indian Exhibition.

CARYOPTERIS, Bunge; *Gen. Pl.*, II., 1157.Caryopteris Wallichiana, Schauer; *DC. Prodr.*, XI, 625;

[VERBENACEÆ.

Vern.—*Mari, mohani*, KUMAON; *Sheekin*, NEPAL; *Malet*, LEPCHA.References.—*Brandis, For Fl.*, 370, *Gamble, Man. Timb.*, 299.

Habitat.—A large shrub with thin, grey, papery bark, peeling off in vertical strips, met with on the outer Himalaya, from the Indus to Bhutan, ascending to 3000 feet.

Structure of the Wood.—Dark grey, moderately hard, with the scent of cherry-wood.

CARYOTA, Linn.; *Gen. Pl.*, III, 918Caryota urens, Linn.; *Gamble, Man. Timb.*, 420; PALME.

KNOWN IN BOMBAY AS THE HILL PALM; also "SAGO PALM"

Vern.—*Mari, Hivo*, Rungbong, zimong, LEPCHA; *Bara flawar*, ASS.; *Salapa*, URITA; *Mari ka jhar*, DEC; *Bherawa, berli, bharli mahad, berli*

CARYOTA
URENS
711

CARYOTA
urens.

Sago Palm

Tomentum
stem fibres

as good as any he had ever seen from Ceylon, and seemed confident a large trade could be done in the Indian fibre

It is commonly reported that in Ceylon the black fibre from the leaf-stalks is manufactured into ropes which are of great strength and durability, being used for tying wild elephants. A woolly material found at the base of the leaves is sometimes used for caulking ships in Burma. In some parts of India the cord-like fibre from the stem of this and other palms is employed as a bow-string or as a fishing line (see B. 667) (Royle, Fib. Pl.)

MEDICINE.
713

Medicine.—“An excellent spirit is obtained by the fermentation and distillation of the toddy obtained from this elegant palm, which is not uncommon on the west coast of the Madras peninsula. It is well adapted for pharmaceutical purposes.” “A glass of the freshly drawn toddy, taken early in the morning, acts as a laxative” (Pharm. of India) of hemicrania, ring the affect.

FOOD.
714

Food.—Roxburgh writes: “This tree is highly valuable to the natives of the countries where it grows in plenty. It yields them, during the hot season, an immense quantity of toddy or palm wine. I have been informed that the best trees will yield at the rate of 100 pints in the 24 hours. The sap in some cases continues to flow for about a month. When fresh, the toddy is a pleasant drink, but it soon ferments, and when distilled becomes arrack, the gin of India. The sugar called jag-gery is obtained by boiling the toddy. The pith or farinaceous part of the trunk of old trees is said to be equal to the best sago, the natives make it into bread, and boil it into thick gruel, these form a great part of the diet of those people, and during the late famine (1830?), they have reason to believe this eaten the gruel, and think it fully get from the Malay countries.”

(F. L. 1114)

“The trees are tapped when they are from fifteen to twenty-five years old. Besides bruising and binding it, the spathe, which is called *kote*, is heated to make the juice flow. Every three or four days a white cottony substance called *kaph*, which forms in the centre of the spathe, is removed. The stem of the tree is so soft that notches cannot be cut, and the tapper climbs by the help of branches tied to the trunk. Tapping goes on for eight months in the year. It is stopped during the rainy season (June to October), because the tree becomes slippery and the spathe cannot be heated. The trees are not allowed to rest, but are tapped until they are exhausted. In good ground they last for ten years, and in poor soil for four or five. After this they are useless. In yield, or in the value of the juice, the big trunked palm differs little from the palmyra. Since 1879, when the tree tax was raised from 1s 6d to 6s (annas 12 to Rs), the number of trees tapped has greatly fallen” (Bomb. Gaz. (Kolaba), XI, p. 30).

TIMBER.
715

Structure of the Wood.—The outer part of the stem is hard and durable, and the vascular bundles crowded, black, very large. The wood is strong and durable, it is used for agricultural purposes, water conduits, and buckets. It is “useful for building purposes” (Thwaites). “Is in general use for field tools” (Bomb. Gaz., XV, I, 65).

716

Cascarilla bark, the bark of *Croton Eluteria*, EUPHORBIACEÆ

A native of the Bahamas. The bark is imported into India

C. 716

Casearia.

CASEARIA
tomentosa.

CASEARIA, Jacq., Gen Pl, I, 796

Casearia esculenta, Roxb, Fl Br Ind, II, 592; SAMYDACEÆ

717

Syn — C LÆVIGATA, Dals, in Hooker's Jour Bot, IV, 107; C CHAN

Dals

Habitat — A tree in the interior of Sikkim

Coorg, comm
to SingaporeMedicine —
people." (Roxb)

Food — "The leaves are eaten in stews by the natives" (Roxb)

MEDICINE

718

FOOD

719

720

C. glomerata, Roxb, Fl Br Ind, II, 591

Vern — Lérjur, SYLHET, Burgonh, NEPAL, Sugvat, LEPCHA

References — Roxb, Fl Ind, Ed C.B.C., 376, Kura, I, 530, Gamble,
Man Timb, 206Habitat. — A shrub or (in the interior of Sikkim) a tree 20 to 30 feet
in height Frequent in Bhután and on the Khásia Hills at an altitude
of 3,000 feetStructure of the Wood — Yellowish white, moderately hard, rough,
weighing between 45 and 48 lb per cubic foot Used for building,
charcoal, and occasionally for tea boxes.

TIMBER.

721

C. graveolens, Dals, Fl Br Ind, II, 592

722

Vern — Chilla, náro, aloal, kathera, pímprí, HIND, Rari, KOL, Beri,
KHARWAR, Newri, SANTAL, Gírchi, tandri, GONO, Rewat, KURKU,
Moda, MARReferences — Brandis, For Fl, 243 Gamble, Man Timb, 206, Dals &
Gibb, Bomb Fl, 11, Lisboa, U Pl of Bomb, 81 and 265Habitat — A shrub or small tree, 20 feet in height, found in Garhwál
and Kumaon, Sikkim at an altitude of 1,500 feet, Deccan Peninsula and
in Burma

Zht

TIMBER

723

the

DOMESTIC

724

C. tomentosa, Roxb, Fl Br Ind, II, 593, Wight, Ic, t 1849.

725

Syn — C ANAVINGA Dals & Gibb, Bomb Fl, 11, C CANZIALA, Ham;
C OVATA Roxb, C ELLIPTICA, WilldVern — Chilla, chilara, bairi, bhari, HIND, Maun, MANBHUM, Roré,
KOL, Beri, KHARWAR, Chorcho, SANTAL, Munkuro-kuri, MAL, Girari,
URIYA, Thundri GOND Khesa, KURKU, Men, wasa, gamgudu, TEL,
Lainja, masses, kareí MARReferences — Roxb, Fl Ind, Ed C.B.C., 377, Brandis, For Fl, 243
Kura, I, 530, Gamble, Man Timb, 206, Stewart, Pb Pl, 44, Lisboa,
U Pl of Bomb, 81 and 273, Drury, U Pl, 118, Thwaites, En
Ceylon Pl, 19Habitat — A shrub or small tree, attaining a height of 25 feet, common
throughout India and CeylonMedicine — The bark is bitter and used as an adulterant for the
(Mallotus philippinensis or) Kamela powder "The pounded fruit yields a

MEDICINE

726

CASSIA
angustifolia

Indian or Tinnevely Senna.

acter prevails also in the West Indies, Brazil, Mauritius, Java, and other tropical countries. Their efficiency, especially in *Herpes circinatus*, is confirmed by Dr. McKenna (*Madras Med Jour*, Vol I, p 431), Dr. Arthur (*Indian Ann of Med Science*, 1856, Vol III, p 632), and others. Favourable statements as to their efficiency in this class of cases are contained in the reports of Dr G Bidie, Dr W J Van Someren, Dr L Stewart, and Dr Rean. As a general rule, they appear to be more effectual in recent cases than in those of long standing. The Bengal Pharmacopœia contains the following formula for an ointment of the leaves, which is described as being almost a specific in ring-worm. 'Take of the fresh leaves of Cassia alata a sufficiency, bruse into a paste, and incorporate with an equal weight of simple ointment.' A more effectual mode of application however, is thoroughly to rub in, over the affected part, the bruised leaves worked into a paste with a small portion of lime juice. In many cases it is productive of excellent effects. The leaves taken internally act as an aperient. Mr. J. Wood reports that a tincture of the dried leaves has been found to operate in the same manner as senna, and Dr. Pulney Andey states that an extract prepared from the fresh leaves is a good substitute for extract of *Colocynth*. It is desirable that further trials should be made with them."

Roxburgh remarks that, according to the Telinga and Tamil physicians, the leaves cure all poisonous bites as well as venereal affections, and strengthen the body. The fresh leaves are often employed to cure ring-worm. They are well rubbed into the parts affected, once or twice a day, and generally with great success. In Jamaica, a poultice made of the flowers is used by the natives in cases of ring-worm (*Dr Wright*).

Special Opinions.—§ 'The roots with *hur* and borax made into paste are used as a specific in ring-worm' (*Assistant Surgeon T N Ghose, Meerut*). "The fresh leaves bruised form an excellent application for ring-worm" (*Brigade-Surgeon F H. Thornton, B A, M B, Honghyr*). "I have used it with good effect in ring worm" (*Surgeon R D Murray, Burdwan*). "I have pretty largely used the fresh leaves bruised on patches of ring-worm met with in this district, with great success. I did not intend to blister the part, but let the patients rub the leaves on the part for a few minutes every day. In most cases the part became natural in about ten days. There is a tendency to relapse, but if the leaves are applied for a few days after the apparent cure, the disease does not reappear" (*Surgeon D Basu, Faridpur*). "The efficacy of the leaves is increased by the addition of common salt" (*Surgeon Major F M. Zorab, Balasore*). "Expectorant, tonic, and astringent, used as a mouth wash in stomatitis" (*Surgeon-Major F M Houston, Travancore, and John Games, Esq, Medical Store-keeper, Travandrum*). "Used in ring worm, but its efficacy is uncertain" (*Brigade-Surgeon S M Shircore, Moorshedabad*). "Efficacious in ring worm" (*Assistant Surgeon Shib Chunder Bhattacharya, Chanda, Central Provinces*). "Leaves fresh rubbed on parts affected with ring-worm with great benefit" (*Surgeon-Major F. J. L. Ratton, Salem*).

Tincture.
735Roots.
736

737

Cassia angustifolia, Vahl, *Fl. Br Ind*, II, 264

INDIAN OR TINNEVELLY SENNA

Syn.—C LANCEOLATA Roxb, IV & A, and (?) Wall., but not C LANCEOLATA, *Forsk* (as in Brandis, *For Fl* 166, C ELONGATA, *Lem lli* ? SENNA OFFICINALIS, Roxb, S ANGUSTIFOLIA, *Balka*

VERO.—Sanki-handi, ARAB and PERS, Hindi-sana, hindi sand-kā-pāi, HIND, Sanna makhi, shōn-pāi, sōn pāi BENG, Sēn makhi mudduwāl, GUJ, Nat kī-sana, nat kī-sana kā-pāi, DUK, Bhūtarāda, mulkēcha,

C. 737

Indian or Tinnevelly Senna.

CASSIA
angustifolia.

shóná-makhi, MAR.; *Néltu-níld-virai*, *níld-virai*, *níla-vákai*, TAM.; *Néla-tangedu*, TEL.; *Níla vaka*, MALA.; *Néldvariske*, KAN.; *Sana-kola*, *níld-vári*, *néld-vári*, SINO.; *Pue-kain-yoe*, BURM.

$$R_{\text{eff}} = \frac{\sum_{i=1}^n R_i}{n}$$

¹ *Dymock, Mat. Med. IV, Ind., 268.*

Habitat.—The plant abounds in the Yemen and Hadramant in Southern Arabia; it is also found on the Somali coast. According to Brandis (who gives incorrectly *C. angustifolia*, Vahl, as a syn. for *C. lanceolata*, Forsk.), this in addition is a native of Sind and of the Panjáb, and is cultivated in many parts of India. The *Flora of British India* says *C. angustifolia* "has no claim to be considered indigenous to India," *C. lanceolata*, Forsk., is a native of Arabia. It seems probable that the mistake made by Dr. Brandis gave origin to the statement (see *Pharmacographia*, also *Bentley and Trimen, Med. Pl.*) that *C. angustifolia* is indigenous to Sind and the Panjáb.

The cultivated plant, as met with in India, is the Tinnevely Senna of commerce, and the uncultivated, the Bombay Senna or *Senna Mekki* or *Sana-maki*, *Sona-maki* of the East. The last mentioned is imported into India from Arabia. In Bombay it is cultivated at Poona to supply the requirements of Government Hospitals and not as an article of commerce. Stocks say it is grown in Sind

Botanic Diagnosis.—This species is closely related to the preceding, but the leaflets are usually 5-8-jugate, are narrower, being oval, lanceolate, tapering from the middle towards the apex; they are longer, often nearly 2 inches long, and are either quite glabrous or furnished with

the commercial forms of senna:—

1st. **TINNIVELLY SENNA.**—This is the leaf obtained from the plant carefully cultivated in South India and (at Poona) in Bombay. Owing to greater care in its collection, Tinnivelly senna is of better quality than the Aschmann's.

Tinnevely.
738

2nd. ARABIAN, MOKA, BOMBAY, or EAST INDIAN SPINA—As already stated, this drug is derived from the wild plant as met with in Southern Arabia, and is imported from Moka, Aden, and the other Red Sea ports to Bombay, and thence re-exported to Europe. From being collected and dried without care, this is mostly an inferior commodity, fetching in London as low a price as 1d. or 1½d. a lb. It is now, however, never adulterated.

Arabian.
739

CASSIA
angustifolia.

Arabian Senna.

MEDICINE.
Leaves.
740

Medicine.—Senna was first made known by the Arabs in the ninth century. It is extensively employed as a simple and active purgative. The Alexandrian is generally regarded as more powerful than Tinnevely and the Arabian or Moka much inferior to either of these. The objections urged against the drug are its taste and the tendency to gripe which it manifests, combined with a somewhat irritant action. These dangers are, however, greatly lessened by administering the drug in the form of an alcoholic preparation, thus very considerably removing the taste. The griping is greatly checked by combination with salines such as bitartrate of potash, tartrate of potash, or sulphate of magnesium, along with an aromatic, as in the preparation commonly known as "black draught." Dr. Sakham Arjun says that the leaves are sometimes chewed in *pan*, "and thus a combination of a laxative and an aromatic corrective is at the same time obtained."

Dr. Waring (*Bazar Medicines*) says: "The imported senna met with in the bazars is usually of very inferior quality, consisting of broken pieces of old leaves, pieces of stem, and other rubbish. That grown in India, especially in Tinnevely, is preferable to that imported from Arabia, which is called *Sana-mukhi* or *Alecca senna*. The leaves should be unbroken, clean, brittle, pale green or yellow, with a heavy smell. It is a good, safe aperient, and may be given as follows: Take of senna leaves one ounce, of bruised ginger and cloves, each half a drachm, boiling water, ten ounces. Let it stand for one hour and strain. This is a good aperient in all cases of constipation, in doses of one and a half to two ounces. Half this quantity, or less, is required for children, according to age."

In a list of Economic Plants sent to the Calcutta International Exhibition a sample of this plant from Cuddapah was described as given in decoction for fevers and also to cattle.

CHEMISTRY

Chemical Composition.—The purgative property is considerably increased by combination with bitters. This fact has been confirmed by many observers. The purgative properties are due essentially to a glucoside acid named *Cathartic Acid*. This, which is almost insoluble in water or strong alcohol, is readily soluble in ether or chloroform. In senna it is, however, combined with calcium and magnesium, and in this form it is very soluble in water, although still insoluble in alcohol. The objectionable taste is removed, therefore, by alcoholic decoction, although the cathartic acid is only slightly altered. Senna yields rapidly one or more of its properties to urine, and 20 or 30 minutes after partaking the drug the urine will indicate these properties by being reddened on the addition of ammonia. Senna taken by wet nurses with equal rapidity influences the milk, purging the sucking infant. If injected into the blood, senna acts as a cathartic.

For further particulars see "*Alexandrian Senna*" under *C. acutifolia*, and for Senna substitutes see *C. oborata*.

Special Opinions.—§ 'Bombay senna, prepared from the same plant as the senna imported from Arabia, has been for many years the only senna obtainable in this market. It now seems likely to be driven out of the market by the lower qualities of Tinnevely senna, which are cleaner and can be purchased at one anna a lb' (*Surgeon-Major W. Dymock, Bombay*). 'Powdered leaves are used in secondary syphilis' (*Surgeon-Major F. J. L. Ratton, M.D., Salem*). 'Senna leaves are always purchased in the bazars and esteemed for their cathartic properties' (*A Surgeon*). 'An efficient purgative, commonly taken by the natives as a cold infusion, causes griping and abundant flow of mucus' (*Assistant Surgeon Shub Chunder Bhutachary, Chanda Central Provinces*). 'Not much used in these days' (*Brigade-Surgeon S. H. Shircore, Moorshedabad*).

Tanner's Cassia.

CASSIA
auriculata.*Cassia auriculata*, Linn ; *Fl. Br. Ind.*, II., 263.

741

THE TANNER'S CASSIA.

Syn.—*SENNA ALRICULATA*, RoxbVern.—*Tarwar*, *tartar*, HIND ; *Duk.* ; *Tarola*, BERRAR ; *Taratada*, MAR ; *Atal*, *atal*, GUJ ; *Awala*, CATCH ; *Ariri*, *ammera cerai*, *atirai*, TAN ; *Tangidu*, *thégedu tangar*, TEL ; *Ararete*, *tengeđu*, *tangédi-gida*, *drara gidi*, *taratadagida*, HAN ; *Arara*, *fonnéciram*, MALA ; *Kanarad*, SINGReferences.—Roxb, *Fl. Ind.*, Ed. C. R. C., 354. Brandis, *For. Fl.*, 165 ;

Exhib.

Habitat.—A tall shrub, with the virgate branches and under-side of the leaves finely grey-downy. Wild in the Central Provinces, the Western Peninsula, South India, and Ceylon; often planted elsewhere.

Gum.—It is said in *Spons' Encyclopædia* to yield a medicinal resin, very scarce; but Dr. Dymock informs the writer he has never seen this supposed resin, although he has frequently handled the bark. In Bengal a brownish sap hardens on the surface of wounds on the bark, this may be the so-called resin.

Tan and Dye.—The bark is one of the most valuable of Indian tans, and is also, like myrabolans, used to modify dyes. It is said to give a buff colour to leather. Bldie remarks that "when the Government Tannery existed at Hunsúr, this bark was used almost exclusively for tanning purposes." This bark was highly commended by the Tanners who attended the conference on tanning materials held at the Colonial and Indian Exhibition in London. It was regarded as a little too dark-coloured, but the leather shown as tanned by it was admired. It was recommended that an effort should be made to have an extract prepared from this bark for export to Europe similar to Cutch. Mr Wardle in his recent report says "The bark does not produce much dye, only light

GUM.
742DYE & TAN.
Bark
743

At Bangalore it is said to be sold at R60 a ton but that the price is rising owing to an increasing demand. The flowers yield a yellow colouring matter, apparently not used economically.

§ "Skins of animals are tanned by soaking them in water in which the bark of this shrub has been infused for several days" (*Honorary Surgeon P. Kinsley, Chicacole, Ganjam*)

Fibre.—Specimens of the bark were sent to the Calcutta Exhibition

Flowers
744FIBRE
745

this plant (Roxb.)

The Purging Cassia		CASSIA Fistula.
<p>extends to Sind and the Western Peninsula Distributed to Arabia, Egypt, Nubia, and Abyssinia</p> <p>Medicine.—The whole plant is sold in the bazars as a substitute for the true senna under the name of country senna Its action is of course Mecca senna</p> <p>rs have confused this with that drug (Conf with</p>		MEDICINE Plant 755
Cassia Buds See Cinnamomum Tamala, Nees, LAURINEÆ		
C. Fistula, Linn, Fl Br Ind, II, 261, Wight, Ic, t 269		756
<p>THE INDIAN LABURNUM, THE CASSIA FISTULA OF PURGING CASSIA, Eng, CASSI OFFICINALE, CASSE MONDEE, CASSE, Fr; ROHRENKASSIE PURGIERCASSIE, FISTELKASSIE, Germ, CASSIA, It, CANA FISTULA, Sp</p> <p>Syn.—CATHARTOCARPUS FISTULA, Pers; CASSIA FISTULA Willd, as in Roxb, Fl Ind</p> <p>Vern.—Amaltās, girmālah, HIND, DUK, Alash, ali, karangal, kiar kaniye Pu Rai k b b k tala k, a n D sha, NETAL Chm BENG Nurus, unras KHARWAR, rlahri, PALAMOW, ri, URIYA, Aitwali, UDH, Jaggarmah, Jaggara, jagarna, kambar, rera, GOND, Banag, baneru, KURKU, Bahasa, bhawā baya bawa MAR, Garmal or garmala, GUJ, Aonraih kay, sharak konraik kay, kone, TAM, Reyru, rela rald rēla kayalu swarnam, TEL, Konnak kāya, MALA, Kakee, KAN, Khiyar shandur, katha ul Hind, ARAB, Khiyar chanbar, PERS, Suvarnaka, aragbadha rājataru, SANS, Ahala or ahilla, SING, Gnooshway, gnoo kyre, BURM</p> <p>References.—Roxb, Fl Ind, Ed C B C, 348, Brandis, For Fl, 1644 kura, For Fl Burm, I, 301, Bedd, Fl Sylv, 91 Gamble, Man Timb, 136 Thwaites En Ceylon Pl, 95, Dals & Sibs, Bomb Fl, 80, Aitchison, Cat Pb Pl, 51, Pharm Ind 65, Mooaeen Sheriff, Supp Pharm Ind, 93 Fluck & Hanb, Pharmacog, 221 U S Dispens, 15th Ed, 368 Benil & Trim, Med Pl 87, U C Dutt Mat Med Hind, 155, Dymock Mat Med W Ind, 209 New Official Guide to the Museums, p 49 Ainslie Mat Ind I 61 Murray Drugs and Pl, Sind 120 B d e Ram Prod Pav Frl k n n D = n d i</p>		
<p>3 H D L S A D C</p>		
Habitat.—A moderate-sized, deciduous tree of the Sub-Himalayan		
		<p>, ascending to 3 000 feet</p> <p>uous tracts skirting the</p> <p>and extending through</p> <p>chiefly occurs as a small</p> <p>, leafless in March, the</p> <p>and fresh green leaves</p> <p>and flowering occurs in</p> <p>-like pods, 1-1½ feet in</p>
		C. 756

CASSIA
Fistula.

The Purging Cassia.

GUM.
757DYE AND TAN.
Bark.
758

Exhibition from Travancore.

Dye and Tan.—Termin-
alla. Dr. McOann Bengal,
a light-red dye is rdant; 2
chittacks of bark with 2 tolas of alum being boiled together. The colour
is deepened by the use of pomegranate rind. Mr. Wardle reports that
the bark contains only a very small quantity of colouring matter. It
yielded yellowish drab with tussar silk, light fawn with corah and eri silks,
and light yellow-brown with wool. The wood ash is used as a mordant
in dyeing. In Dacca and in Cuttack the bark is used as a tan. McOann
describes the process of tanning as follows: "Skins, after being treated
with lime and cleaned, are sc
pounding the bark of *sunari*
tomentosa), and pods of *kun*..
for 24 hours. The process
(now Sir E.) Buck says it is used to a small extent in Cawnpore and at
Bijnor. Experiments were tried at the Government factory, the result
being that *amaltis* bark was pronounced a very valuable tanning mate-
rial. The North-Western Provinces do a small trade in exporting the
amaltis bark.

MEDICINE.
Pulp
759
Root bark
760

Medicine.—The PULP of the fruit and also the ROOT-BARK are used medi-
cinally. They constitute, especially the former, one of the commonest and
most useful of domestic medicines—a simple purgative. This drug is also
used as a mild cath-
pods be warmed to
almond oil for use.

In small doses (3'9 to 7 8 gr.) it may be prescribed as a laxative, and larger
doses (31'1 to 62 2 gr.) as a purgative. (*U. S. Dispens*). It is described as
regarding their obstructions. It is often combined

regarded as a good purge for
ut and rheumatism (*Dymock*).

The FLOWERS are made into a
"fabre lura." "The BARK and
istules" (*Drury*),
ed as an external

applicant in skin diseases, especially in ring-worm. *iii*. Campbell says
that the *Santals* use an infusion of the leaves as a laxative. Dr. Irvine
(*Med. Top. of Ajmir*) states that he found the root act as a strong pur-
gative. Thwaites says that every part of the plant is used as a purga-

According to *Bellew*, the root is given as a tonic
-t. *Pb. Pl.*, 62).

Kassia sūpiyē (Greek) was first
-fabe nasant

Flowers.
761
Bark.
762
Leaves.
763
Root.
764

CASSIA
Fistula.

The Perfing Cassia.

GUM.
757

length, ripen in the cold season. U O Dutt thinks this must be *Rajataru* of the Sanskrit writers, the king of trees.

Gum—From the stem exudes a red juice which hardens into a gummy substance. This is generally known as *kamrak*. Its economic uses, if any, are at present unknown to authors on Indian economic science but it is stated to be astringent. A specimen was contributed to the Paris Exhibition from Travancore.

DYE AND TAN.
Bark
758

Dye and Tan—The bark is used in tanning, chiefly along with *Terminalia*. Dr McOann reports that in the district of Lohardigā, in Bengal, a light red dye is obtained from the bark, with alum as a mordant, 2 chittacks of bark with 2 talis of alum being boiled together. The colour is deepened by the use of pomegranate rind. Mr Wardle reports that the bark contains only a very small quantity of colouring matter. It yielded yellowish drab with tussar silk, light fawn with corah and eri silks, and light yellow brown with wool. The wool wash is used as a mordant in dyeing. In Dacca and in Cuttack the bark is used as a tan. McOann describes the process of tanning as follows: "Skins, after being treed with lime and cleaned, are soaked in the astringent solution prepared by pounding the bark of *sunari* (*Cassia Fistula*) bark of *Asan* (*Terminalia tomentosa*), and pods of *kunt* (*Cæsalpina digyna*), and soaking in water for 24 hours. The process of soaking is repeated three times." Mr (now Sir E.) Buck says it is used to a small extent in Cannanore and at Bijnor. Experiments were tried at the Government factory, the result being that *amaltis* bark was pronounced a very valuable tanning material. The North-Western Provinces do a small trade in exporting the *amaltis* bark.

MEDICINE
Pulp
759
Root bark
760

Medicine—The **PULP** of the fruit and also the **ROOT-BARK** are used medicinally. They constitute, especially the former, one of the commonest and most useful of domestic medicines—a simple purgative. This drug is also used as a mild cathartic. The *Malakcan ul Adriya* recommends that the pods be warmed to extract the pulp which should then be rubbed up with almond oil for use. It is a safe purgative for children and pregnant women. In small doses (3 gr to 7.8 gr) it may be prescribed as a laxative, and larger doses (31.1 to 62.2 gr) as a purgative (*U S Dispens*). It is described as lenitive and useful in relieving thoracic obstructions. It is often combined with tamarinds, and in this preparation is regarded as a good purge for adult bile. Externally it is useful in gout and rheumatism (*Dymock*). It is also employed in the essence of coffee. The **FLOWERS** are made into a confection, known as *gul-kand*, and viewed as a febrifuge. "The **BARK** and **LEAVES** rubbed up and mixed with oil are applied to pustules" (*Drury*). As in most other species of this genus, they are valued as an external applicant in skin diseases, especially in ring-worm. Mr Campbell says that the Santals use an infusion of the leaves as a laxative. Dr Irvine (*Med Top of Ajmer*) states that he found the root act as a strong purgative. Thwaites says that every part of the plant is used as a purgative by the Singalese. According to Bellow, the root is given as a tonic and febrifuge in the Panjab (*Dr Stewart Pb Pl*, 62).

Flowers
761
Bark
762
Leaves
763
Root
764

The name *Cassia Fistula* (Latin) and *κασίας σφύρης* (Greek) was first applied to a form of cinnamon very similar to the *Cassia Lignea* of the present day, the name *Fistula* having been given because of the bark being rolled up. The tree which now goes by that name was described by Abul Abbas Annabati of Sevilla in the thirteenth century, and the fruit is mentioned as a medicine by Joannes Actuarius who flourished in Constantinople towards the close of that century. The drug was a familiar remedy in England in the time of Turner, 1568 (*Fluck and Hanb Pharmacog*, 222). It is never prescribed at the present day in England, except in the form of the well-

The Purging Cassia.

CASSIA
lanceolata.

is an ingredient. ive when procur-
eks, even within
Moorshedabad)
luse" (Surgeon-
Major J. E. T. Atchison, Simla). "A poultice made of the leaves is said
to relieve the chilblains which are common in Upper Sind. It has been
beneficially used in facial paralysis and rheumatism when rubbed into the
affect
affect
Shik
act
Mac
geor
I fr

ounce with warm milk at bed-time is enough for a dose" (Surgeon-
Major R. L. Dutt, Pubna). "The pulp of the ripe pod is commonly used
as a purgative mixed with tamarind pulp; taken as a drink at night, this
acts on the bowels mildly the following morning" (Assistant Surgeon
Shib Chunder Bhattacharya, Chanda, Central Provinces). "In the statu-
lent colic of children, it is commonly applied round the navel to produce
motions. The new leaves worked down to a paste are applied in ring-
worm" (Assistant Surgeon T. N. Ghose, Meerut). "A good purgative, ex-
tensively used by natives" (Honorary Surgeon Easton Alfred Morris,
Negapatam). "A favourite laxative and purgative amongst natives"
(Assistant Surgeon Nehal Sing, Saharunpore).

Food—The leaves, parched, are said to be eaten as a mild laxative
with food. "The flowers are largely used by the Santals as an article of
food" (Campbell). The pulp of the pods is largely used in Bengal to
flavour native tobacco.

Structure of the Wood—Sapwood large, heartwood varying in colour
from grey or yellowish red to brick-red, extremely hard. The difference
between the wood of this tree and that of *Ougeima dalbergiodes* consists
in the fact that in the former the patches of white soft tissue form con-
tinuous belts, whereas in the latter they are rhomboidal, pointed at
the ends, and form interrupted belts.

The wood is very durable, but rarely of sufficiently large size for
timber. It makes excellent posts, and is good for carts, agricultural
implements, and rice pounders.

MEDICINE

FOOD.
Leaves
765
Flowers
766
Pulp mixed
with tobacco
767
TIMBER
768

Cassia glauca, Lam, Fl Br Ind, II, 265

Vern.—Konda tantepu chettu, TEL, Wal ahalla, SING.

References.—Roxb, Fl Ind, Ed C B C, 352; Kurz, For Fl Burm, I,
394, Gamble, Man Timb, 136, Thwaites, En Ceylon Pl, 66, Balfour,
Cyclop

Habitat.—A small tree of the eastern part of South India and of
Burma to Ceylon and Malacca.

Medicine.—The bark mixed with sugar and water is given in diabetes,
and a preparation of the bark and leaves, mixed with cummin seed, sugar
and milk, is given in virulent gonorrhoea (Balfour).

MEDICINE.
Bark
770
Leaves
771

C. lanceolata, Roxb, Wall, W & A (but not of Forskhal), also
[C. angustifolia, Vahl]

C. lanceolata, Nectoux, see C. acutifolia, Delile.

C. 771

CASSIA
obovata.

Country or Italian and Jamaica Senna.

772

Cassia lanceolata, Forskhal

This species is, by the majority of authors, viewed as quite distinct from either *C. acutifolia* or *C. angustifolia*. It is a native of Arabia, and doubtless to a certain extent is used as a substitute or adulterant for the Mecca senna. It differs chiefly from *C. acutifolia* in having glandular petiolets, the plants are, however, very nearly allied, and as Forskhal's description is anterior to Desfilis's account of *C. acutifolia*, both might be reduced to one, which in that case would have to receive the name *C. lanceolata*, Forskhal. Most Indian authors give *C. lanceolata*, Forskhal, but in the writer's opinion incorrectly, as a synonym for *C. angustifolia*, Vahl.

C. Lignea See *Cinnamomum Tamala*, Nees, LAURINEÆ.

773

C. marginata, Roxb, *Fl Br Ind*, II, 262, Wight, III, t 83Syn.—*C. Roxburghii*, DCVern.—*Urimidi*, *uskiamen*, TEL, *Ngoomee*, BURM, *Ratoo-maa*, SINGReferences.—Roxb, *Fl Ind Ed C B C*, 350 DC *Prod II* 489, W & A *Prod* 286; Gamble, *Man Timb*, 137, Thwaites, *En Ceylon Pl*, 95, Bedd, *Fl Sylv*, t 130

Habitat.—A small deciduous tree, with deeply cracked, brown bark, found in the Western Peninsula, and in Madras, Ceylon, and Burma (Thoungyeen forests)

Structure of the Wood.—Heartwood light brown very hard. The wood is well adapted for turning, naves of wheels, and handles of tools

TIMBER

774

775

C. mimosoides, Linn, *Fl Br Ind*, II, 266Vern.—*Patwa ghas*, SANTAL

Habitat.—Grows on the Himalaya, ascending 5,000 to 6,000 feet in Kumaon, and on the hills of Bengal and of the Khasia, to Ceylon and Malacca

Medicine.—§“ Root given for spasms in the stomach (*Rev A Campbell, Santal Mission, Pachamba*)

MEDICINE

Root

776

777

C. nodosa, Ham, *Fl Br Ind*, II, 261Vern.—*Gnu-theing*, BURMReferences.—Mason's *Burm*, 494 770.

Habitat.—A common species in the Eastern Himalaya, Manipur, and Burma

It has the properties assigned to most of the wild species

778

C. obovata, Colladon, *Fl Br Ind*, II, 264; Wight, Ic, t 575Syn.—*CASSIA SENNA*, Linn, ?*SENNA OBTUSA*, Roxb

Known in India, as COUNTRY SENNA, and as ITALIAN, TRIPOLI, and JAMAICA SENNA, from its being one of the first species made known to Europe, it was cultivated in Italy during the 16th century

Vern.—*Bhat Tarwar*, BOMB

References.—Roxb *Fl Ind (Ed C B C)* 352, W and A *Prod* 289; *Modern Sheriff, Supp Pharm Ind*, 94 in part, *Fisch and Hand Pharmacog*, 218, *Bentley and Trim, Med Pl Wp U S Dispens*, 1297, *Ainslie Mat Med*, II, 249; *Treasury of Botany Dymock, Mat Med II Ind*, 253

Habitat.—The Western Peninsula, Mysore, and South India, especially the Coromandel coast. A small shrub, with the leaves smaller (leaf

C. 778

Negro Coffee.

CASSIA
occidentalis.

lets 3-6 pairs) than in *C. Burmannii*, and the pods not near so prominently tubercled over the seeds as in that species.

The writer is by no means certain that he is correct in regarding the plant known in Europe as *C. obovata* as distinct from the Indian corresponding species, still less, in viewing *Roxburgh's Senna obtusa* as more

MEDICINE.
Leaves
779

Cassia occidentalis, Linn ; *Fl. Br. Ind* , II., 262.

THE NEGRO COFFEE.

Vern.—*Kasōndi*, *barti-kasōndi* or *kisunda*, HINDO and DUK , *Hikal*, BOMB ; *Kasamara*, SANS , *Kalkashundā*, BENG , *Nattam takara*, *peyd-teri*, TAM ; *Kasindhā*, TEL , *Natram takara*, MALA ; *Kalan*, *meeali*, *maigali*, BURM , *Peni-lōra*, SING . The same vernacular names are generally given to this species as to *C. Sophera*.

References.—*W & A*, *Prod*, 200; *Bot Reg*, t 83; *Roxb*, *Fl Ind*, Ed C & C, 352; *Thwaites*, *En Ceylon Fl*, 95; *Dals & Gids*, *Bomb Fl*, 81; *Aitchison*, *Cat Pb Pl*, 52, *Pharm Ind*, 78; *Moodeen Sheriff*, *Supp Pharm Ind*, 94; *Dymock*, *Mat Med W. Ind*, 2nd Ed, 262; *O'Shaughnessy*, *Beng Dispens*, 309, *S Arjun*, *Bomb Drugs*, 4; *Drury*, *U Pl*, 121, *Lisboa*, *U Pl of Bomb*, 198; *Spens*, *Encycl*, 707, 798; *Balfour*, *Cyclop*, *Treasury of Botany*, *New Official Guide*, *Museum*, p 50; *New Reports*, 1877, p 39; and 1881, pp 34 35

Habitat.—A diffuse, sub-glabrous under-shrub, scattered from the Himālaya to the Western Peninsula, Bengal, South India, and Burma to Ceylon. Probably introduced. Distribution cosmopolitan in the tropics.

Medicine.—The LEAVES, ROOTS, and SEEDS are used medicinally; and by Hindū and Muhammadan writers they are supposed to have the same properties as *C. Sophera*. They are "alexipharmic, useful in the expulsion of

In the
are em
the forr
the roo

MEDICINE.
Leaves
781
Root.
782
Seed.
783

the leaves,
the forr
the roo

taken internally and applied externally, are given in cases of itch and other cutaneous diseases, both to men and animals. The negroes apply the leaves, smeared with grease, to slight sores, as a plaster. The root is said by Martius to be beneficial in obstructions of the stomach, and in incipient dropsy. (*Drury, U Pl*)

Chemical Composition.—Professor Clonet has analysed the seeds. The following abstract of his views and results taken from the *Year-Book of Pharmacy for 1876*, p 179, will be found instructive —

"Fatty matters (olein and margarīn), 49; tannic acid, 09; sugar, 21; gum, 255; starch, 20; cellulose, 340; water, 70; calcium sulphate and

CHEMISTRY.

CASSIA
occidentalis.

Negro Coffee.

MEDICINE.

phosphate, crysophanic acid, 0.9; malic acid, sodium chloride, magnesium sulphate, iron, silica, together, 5.4; and nchrovine, 13.53 parts in 100. The latter substance was obtained by exhausting the powder of seeds, previously treated with ether, by means of alcohol of 60 per cent; the alcohol is distilled off, the syrupy residue treated with absolute alcohol, which dissolves out various constituents, leaving a solid brown-red mass, having when dry a resinous fracture, and being soluble in water, to which it communicates a garnet colour. It contains C, H, O, N, and S, but its exact composition has not been determined. (It is most likely a mixture of various bodies.) It is soluble also in weak alcohol, and in acids and alkalies. The colour cannot be fixed upon tissues by any known mordant. This circumstance induced the author to term it *achrosine*, or 'not-colouring,' although being coloured itself."

Special Opinions—§ "Leaves pounded and made into a paste are applied to fresh wounds to bring on their healing by first intention" (*Assistant Surgeon Anund Chunder Mukarji, Noakhali*). "The mature seeds are used as an external application in ring-worm" (*Surgeon F. H. Thornton, B.A., M.B., Monghir*). "The seeds are used in the treatment of scabies" (*Surgeon-Major C. W. Calthrop, M.D., Meerut*).

Food.—In the Kew Reports interesting information is given regarding the use of the seeds of this plant as a substitute for coffee. The following passages may be republished here.—

"**NEGRO COFFEE**.—The Commissioners of Customs forwarded to me in the early part of the year a sample of an article imported at the port of Liverpool from Bathurst, River Gambia, under the above name. They were identified at Kew as the seeds of *Cassia occidentalis*. According to Livingstone, these are used under the name of '*Fed-gosa* seeds' on the Zambesi as a substitute for coffee. Monteiro, however, states in his '*Angola and the River Congo*' (*Vol. II, p. 249*) that *Fedegora* seeds are used only medicinally as a substitute for quinine. The seeds are roasted and ground, and their infusion taken either alone or generally mixed with coffee" (*1877, p. 39*).

"These seeds occasionally find their way into the European market. The following extract from a letter from Dr. Nicholls of Dominica, dated September 27, 1881, shows that their use is well known amongst the negro inhabitants of that island.—

"*Cassia occidentalis* is, I find, an excellent coffee substitute. It is called in Dominica by the following names '*P'herbe puante*,' '*café marron*,' and '*wild coffee*.' I have often heard of the negroes using the seeds of a native plant as coffee, but it is only lately that I have enquired into the subject, with results that will, I believe, be of interest to you.

"I collected some seeds and directed my cook to roast and grind them, so that I might taste the 'coffee.' Other matters engaging my attention, I forgot the circumstance until several days afterwards, when one evening my wife enquired how I liked my after dinner cup of coffee. I turned to her enquiringly, when she laughingly said, 'That is your wild coffee.' I was indeed surprised, for the coffee was indistinguishable from that made of the best Arabian beans, and we in Dominica are celebrated for our good coffee. Afterwards some of the seeds roasted and ground were brought to me, and the aroma was equal to that of the coffee ordinarily used in the island.

"I intend to send you a good quantity of the '*café marron*' in its stages of preparation, in order that you may have an opportunity of undergoing my experience, and afterwards, you will, I think, be willing to raise *Cassia occidentalis* above the rank of a weed. I may inform you that the plant itself is used by the native 'doctors' medicinally in the

FOOD
Seeds.

784

NEGRO
COFFEE

Kasóndi Senna

CASSIA
Sophora.

FOOD

Cassia Oil. See *Cinnamomum zeylanicum*.*C. siamea*, Lamk ; *Fl Br Ind*, II, 264

785

Syn.—C FLORIDA, Vahl ; SENNA SUMATRANA, Roxb

Vern.—Kassod, BOMB ; Beati, manye konne, TAM ; Sime tangadi, KAN ; Waa, SING ; Matsalee, BURM

References.—Roxb, *Fl Ind*, *Fd C B C*, 353, *W & A Prod*, 288, *Kura. For Fl Burm*, I, 392, *Gamble, Man Timb*, 138, *Thwaites, En Ceylon Pl*, 66, *Bedd, Fl Sylva*, t 179 ; *Kew Official Guide, Museum*, p 49 ; *Mason's Burma*, 404

Habitat.—A moderate-sized tree, with smooth bark, found in South India, Burma, and Ceylon Distributed to the Malayan Peninsula and Siam

Structure of the Wood.—Sapwood whitish, rather large Heartwood dark brown, nearly black, very hard and very durable Used in Burma for mallets, helves, and walking sticks In South India it is little known, but it is considered one of the best kinds of fuel for locomotives in Ceylon (*Beddome*)TIMBER.
786*C. Sophora*, Linn, *Fl Br Ind*, II, 262

787

Syn.—SENNA SOPHERA and S ESCULENTA, Roxb ; C CHINENSIS, Jacq ; SENNA PURPUREA, Roxb

Vern.—Banar, kdsunda, bds ki kasóndi HIND ; Kol kashunda BENG ; Sari kasóndi, jangli takla, DUK ; Auwadice, GUJ ; Ran tónkala, MAR ; Ponna-ciral periya takarai perá-virai TAM ; Paidi tangedu, nuti kashindha, kasu mardhakamu, tagara chettu, TEL ; Ponnám-takara, MALA ; Kasamarda, SANS ; Oru tora, SINGH

Ref.—*Fl Br Ind*, *Fd C B C*, 353, *W & A Prod*, 288, *Kura. For Fl Burm*, I, 392, *Gamble, Man Timb*, 138, *Thwaites, En Ceylon Pl*, 66, *Bedd, Fl Sylva*, t 179 ; *Kew Official Guide, Museum*, p 49 ; *Mason's Burma*, 404Habitat.—A closely allied species to *C occidentalis*, from which it differs by its more shrubby habit, more numerous smaller and narrower leaves. It is found in the same localities as *C. siamea*.) Cos-Himá-the JUICE of the leaves is viewed as a specific in ring worm, specially when made into a plaster in combination with sandal wood A paste made from the root is sometimes used instead of the juice of the leaves The powdered seeds are used as a remedy for ring worm and itch The Sanskrit name is *Kasóndi* by Hindus to have works as a remedy for ring worm and itch pepper The bark, in the form of infusion and the powdered seeds, mixed with honey, are given in diabetes (*Drury*). "An ointment made of the bruised seeds and leaves and of sulphur is used in itch and ring-worm" (*Taylor's Top of Dacca*)MEDICINE
Bark
788
Leaves
789
Seeds
790
Juice
791

C. 791

CASSYTHA
filiformis

The Fœtid Cassia: Akaswel

MEDICINE

Leaves

799

Seeds

800

Medicine.—The LEAVES are used as an aperient, both LEAVES and SEEDS constitute a valuable remedy in skin diseases, chiefly for ringworm and itch. This is known in Sanskrit as *Chitravardī*. Dr Dymock says: "Chitravardī directs the seeds to be steeped in the juice of *Euphorbia nerifolia*, and afterwards to be made into a paste with cow's urine as an application to cheloid tumours. He also recommends the seeds, together with those of *Pongamia glabra*, as a cure for ringworm." Muhammadan writers "consider the seeds and leaves to have solvent properties in those forms of skin disease accompanied by induration, such as leprosy, cheloid, psoriasis, &c, and mention their having been used with advantage in the plague (raba)." O Shaughnessy remarks that the leaves "are much used for adulterating *senna*." There is no evidence that this is done at the

Root

801

rub-
ring-
owe
European
id smell-
ed in the
ildren as
are con-
ith sour-
the root,
ne of the

§ "I have used the powdered leaves of a Cassia shrub common in
oblie's itch" (*Deputy Surgeon*).

FOOD

Seeds

802

Coffee
substitute

803

Leaves.

804

are eaten in times of scarcity.
- D. I. D. ... is worthy
to
al

America, and the West Indies (see *C. occidentalis*).

The tender leaves are boiled and eaten as a pot-herb. They are largely used during times of famine (Lisboa). The Santals regularly use this pot-herb, both leaves and fruit (*Campbell*).

§ "The seeds are said to yield a decoction which is reported to be in every respect as good as coffee" (*Mr C D Hardinge, Rangoon*). "A kind of coffee is made from this in Arracan" (*Prof Romanis, Rangoon*).

CASSIS, see *Ribes nigrum*.

CASSYTHA, Linn., Gen Pl., III., 164

805

Cassytha filiformis, Linn., Fl Dr Ind., V., 188, Wight, Ic., 1847;

LAURINEÆ

Vern.—Amarbeli, Hind.,
BOMB., *Amarulla*, MAR.
TEL., *Acatyabull*, MAL.
References.—Kord., Fl.
Fl., 223 *Thwaites*, Fu C.
200 Dymock, Mat Med.
Murray, Pl and Drugs o
Bomb Drugs, 115, Treas.

Alogjari, S
Cotton TAM
S, Shway
342, Dals
C Dutt,
U Pl
17, C.

C. 807

Sweet or Spanish Chestnut

CASTANEA
vulgaris.

Habitat.—A small parasitic plant, much resembling a *Cuscuta*, for which it is often mistaken; met with in almost every part of the coast of India and very general from Banda to Bengal. It is common in the hotter parts of Ceylon, especially near the sea (*Thwaites*). Distributed to Arabia, Africa and America, and through the Polynesian islands to Australia.

Medicine.—"*Akaswel* is used in native practice as an alterative in bilious affections and for piles" (*Dymock*). "It is put as a seasoning into butter-milk, and much used for this purpose by the Brahmans in South India" (*Ainslie*). "The natives of the Malabar coast use it as a seasoning for butter is it is emg plant mnd U Pl)"

MEDICINE.
Plant.
806

by the natives in a vapour bath for
tion being placed under the bed"
(*Assistant Surgeon Bhugwan Das, Rawal Pindi, Panjáb*). "Sanskrit writers describe it as a tonic and alterative, and regard it as possessing the property of increasing the secretion of semen" (*U C Dutt, Civil Medical Officer, Serampore*).

Domestic.—"A portion of the plant is by the Santal tied round the neck, arm, and ankles, as a cure for rickets" (*Rev. A. Campbell, Report, Chutia Nagpur*).

DOMESTIC.
Charm.
807

CASTANEA, *Gartn.; Gen Pl, III., 409.*

[FERE.]

Castanea vulgaris, Lam, DC. Prodr, xvi, 2, 114, 683; Cupuli-

THE SWEET CHESTNUT OF SPANISH CHESTNUT; CHÂTAIGNIER,
Fr.; Edelkastanie, Germ

Syn.—*C vesca, Gartn*

References.—*Brandis, For Fl, 491, Gamble, Man Timb, 379, DC, Origin of Cult Pl, 353; Smith, Dic, 110.*

Habitat.—"A large, long-lived, deciduous tree, of rapid growth, more rapid than the oak, introduced in the Himálaya, and grown in various localities, and especially in a large number of places in the Panjáb and the hills of the North-West Provinces, in Darjiling, and the Khásia Hills" (*Gamble*).

Cultivation.—"It has been sown or planted in several parts of the

CULTIVATION
809

which bear two or three, separated by a membrane, which is the natural state of the species" (*DeCandolle, Orig Cult Pl*)

Food.—The nuts are eaten. When ground into meal they form an important article of food for the poor. Mr. Atkinson says the tree was introduced by Sir John Strachey in Kumáon, and in Dehra by Dr. Jameson, where the fruits are now brought into the market.

FOOD.
810

Structure of the Wood.—Sapwood white, heartwood dark brown. Weight from 32 to 54 lb per cubic foot. "The timber is not so durable as that of oak; in the south of Europe it is used for building, furniture, and cask-staves, but the legends of the roofs of old churches and other buildings made of chestnut timber, in France and England, are mythical, where ever examined, such timber has been found to be oak. It coppes

TIMBER.
811

CASTANOPSIS
tribuloides.

Probable New Tanning Material for India.

vigorously; along the Vosges it is grown for vineyard poles, in Kent and Sussex for hop-poles" (Brandis).

CASTANOPSIS, Spach.; Gen. Pl., III., 409.

Several species of this genus are met with on the mountains of Eastern India, but none are reported to be used for tanning. This is probably an oversight, since the European members possess this property to a considerable extent, *Castanea vesca* containing 14 to 20 per cent. of tannic acid.

812 *Castanopsis indica*, Alph. DC., Prodr., XVI., 2, 109; CUPULIFERÆ.

ka.
ya,

References.—Brandis, For. Fl., 490; Gamble, Man. Timb., 388; Kurz, For. Fl., Burm., 478; Balfour, Cyclop.

Habitat.—A moderate-sized, evergreen tree, met with in Nepal, East-

he filbert both in

nd is very largely
is often pollarded

and the branches burnt for manure.

815 *C. rufescens*, Hook f. & Th.; Gamble, Man. Timb., 389

Vern.—*Dalné katás*, NEPAL; *Sirikishu*, LEPCHA, Hingori, ASS

Habitat.—A very large evergreen tree of Sikkim Himalaya, from 6,000 to 9,000 feet.

Food.—The fruit is small, but edible and of good flavour

Structure of the Wood.—Gr. marked by narrow
belts of firmer texture. It is
cultural implements, and other
phylla, which it very closely res.
is more valuable as plank and posts wherever exposed to wet than
other species of this genus.

818 *C. tribuloides*, Alph. DC., Prodr., XVI., 2, III; Wright, Ic., t. 770.

Syn.—*CASTANEA TRIBULOIDES*, Kurz (II., 480); *QUERCUS PEROV*, and *Q. ARMATA*, Roxb., Fl. Ind., Ed. C B C., 673

Vern.—*Tamari*, kalong, KUMAON; *Musré katás*, kotur, chisi, maku, shingali, NEPAL; *Bar hingori*, kanta singar, ASS., Dingsaot, KHASIA, Singhara, TIPPERAH; *Kanta lat balang*, CHITTAGONG, Kyantia, BURM.

References.—Gamble, Man. Timb., 389; Brandis, For. Fl., 490; Balfour, Cyclop.

South-East Kumaon, Nepal,
t, in Chittagong

Annual rings
being good and

durable.

C. 820

FOOD.
819
TIMBER.
820

The Bay Chestnut The Ule Tree.

CASTILLOA
elastica.

The tree coppices admirably, and with *Castanopsis indica*, *Quercus spicata*, and *Engelhardtia* might be grown on the hills wherever firewood and charcoal forests are required

CASTANOSPERMUM, *A. Cunn*, *Gen Pl*, I, 556

"A genus of plants so named in consequence of the supposed resemblance of the seeds to the sweet chestnuts of Europe"

Castanospermum australe, *A. Cunn*, LEGUMINOSÆ

821

THE MORETON BAY CHESTNUT

References — *Drury, U Pl*, 124 *Balfour, Cyclop*, *Smith, Dic*, 110
Treasury of Botany

Habitat — A tree of the sub-tropical regions of Australia, occasionally planted for ornament, introduced into India about thirty years ago

Food — The seeds are eaten by the natives of Australia, but are unpalatable to Europeans (*Smith*)

Structure of the Wood — White, with a yellowish tinge, hard

FOOD.
822
TIMBER
823

CASTILLOA, *Cerv*, *Gen Pl*, III, 372Castilloa elastica, *Cerv*, URTICACEÆ

824

THE ULE TREE

References — *Brandis, For Fl*, 427 *Kurz For Fl*, *Burm*, II, 419
Smith Dic, 87-89 *Spon's Encyclop*, 1659-61 *Reports of Bot Gard*
Nilgiri Hills, for 1881-82, 1882-83, and 1883-86

Habitat — A lofty forest tree of the Bread fruit family, native of America, lately introduced into Ceylon and some parts of India. In *Kew Report for 1877*, p. 15, is given an account of the attempts made to introduce this plant into India. Burma, Assam, Ceylon, and the lower slopes of the Nilgiris have now been pronounced as suitable for its cultivation

Mr. Langson says of the Nilgiris — "In these days of uncertain coffee prices, it is worth trying to cultivate any plant that will grow in the hills. I have no doubt many local varieties will be found to suit the place."

Colonel Campbell Walker writes of Castilloa cultivation in Calicut — "It has been found easy to raise these trees from cuttings. I hope they will be found to suit the place either from the seeds or from cuttings."

because we have not

Gum — The tree

ened, forms what is c

tries the trees are cut do

a few inches of the b

vessels are placed un

on exposure to the a

of the juice of *Ipomoea bona-nox*

For further particulars of this gum see under "India rubber"

GUM
825

Castor Oil, see *Ricinus communis*, *Linna*, EUPHORBIAEÆ

C. 825

CASUARINA
equisetifolia.

Beefwood of Australia.

826

CASUARINA, *Forst*, *Gen Pl*, III, 402
Casuarina equisetifolia, *Forst*; *DC. Prodr.* XVI, 2, 338, CASU-
 THE BEEFWOOD OF AUSTRALIA [ARINACEÆ]

Syn — *C. MURICATA*, *Roxb*, *Fl Ind*, Ed C B C, 623

Vern — *Yangli saru*, HIND, *Yau*, BENG, *Vilayatisaru* *vilayati saru*, *saroka phar*, BOMB, *Jurljwr*, *mujjun* SIND, *Sarphkala sarova saru*, MAR, *Yanglihdá*, *jangli saru*, *jangli saru chal*, DUK, *Chouk shaou-ku maram*, *shavuku pattay*, TAM, *Serra*, *chavuku mánu*, *chavuku palla*, TEL, *Kásrike*, *Myson*, *Sura* KAN, *Aru*, *chavaka maram*, MALA, *Tin yu*, BURM. Many of the Indian names are modern adaptations, Conf with *Tamarix*.

References — *Gamble*, *Man Timb*, 346 *Brandis* *For Fl*, 435, *Kurz* *For Fl*, *Burm*, II, 404, *Dals & Gids*, *Bomb Fl*, *Suppl* 82 *Pharm Ind*, 217; *Moodeen Sheriff*, *Suppl Pharm Ind*, 96, *Dymock* *Med Med W Ind*, 2nd Ed, 750, *Ainslie* *Med Med Ind*, II, 443 *Murray Drugs and Pl*, *Sind*, 27, *Isotard*, *Dyes of India*, 10, *Wardle*, *Dyes of India*, I, 45; *Bidie*, *Cat Ram Prod* *Paris Exh*, 45 *S Arjun Bomb Drugs*, 131, *Drury*, *U Pl*, 124, *Baden Powell*, *Pt Pr* 573, *Lubbock*, *U Pl of Bomb*, 132, *Ken Cat* 121, *Hutchins*, *Report on the Madras*, 1883, *Report*, *Agri Dept*, *Madras*, 1878 79, pp 38 39, *Balfour*, *Cyclop*, *Smith*, *Dic*, 203; *Treasury of Botany*

Habitat — A large, evergreen tree, with leafless, drooping branches and branchlets, which are deciduous and perform the functions of leaves. Found on the coast of Chittagong, Burma, the Malay Archipelago, North Australia, and Queensland, cultivated all over India, except in the north-western portion of the Panjáb. Thrives best in the sandy tracts near the sea shore. Introduced into the plains of India as a road side tree (valuable on account of the rapidity of its growth) about the beginning of the present century, and from its resemblance to the *Tamarix* received the vernacular names of that plant.

Cultivation — "It has been largely planted in North Arcot, South Arcot, Madras, and other districts of the Madras Presidency for fuel, for which it is excellent, but it requires to be near the sea-coast and to have water at the roots at least 10 feet from the surface of the ground. Trees planted in sandy soil often suffer much from drought the first two or three years, the tap-root then finds its way down to about 10 feet, and reaching water the tree begins to thrive. It is of course best near the sea, but fine trees may be seen in places in Northern India, especially at Saharanpur and Amballa" (*Gamble*).

The Madras Agricultural Report for 1878-79 gives particulars of the cost of cultivation of an acre containing 1,200 trees. The initial cost is put down at Rs5 with interest at 10 per cent for four years this raises the gross capital to Rs19. At this time half the trees (600) should be removed. Valuing these at 8 annas each the capital is returned and a balance left of Rs1. Two years later another 200 trees are removed worth Rs1 each, and in the eighth or ninth year the land may be cleared, the remaining trees, at the lowest estimate, after paying all expenses on the same, would realize Rs600.

Gum — Reported to yield a good resin.

Dye — The bark is used in tanning (*Birdwood*, *Bomb Prod*, and *Bidie*, *Mad Exh List for 1855*). A brown dye is extracted from it according to Balfour. Mr Wardle remarks "The bark contains a small quantity of colouring matter, and produces in dyeing light reddish drab colours on each of the fabrics on which I have experimented." He further adds "The shades produced by this dye-stuff are very good."

C. 829

CULTIVATION
827GUM
828
DYE
829

Cedrelas or Toon woods

CEDRELA.

though faint, but the dye-stuff contains too small an amount of colouring matter to be of any great value in the dye house ' Lisboa says that it is used in Bombay as a mordant

Medicine—The bark is slightly astringent, and is employed in infusion as a tonic, according to Dr Gibson it is an excellent and at the same time a readily available astringent, useful in the treatment of chronic diarrhoea and dysentery (*Murray*)

Structure of the Wood—White, brown near the centre, very hard, it cracks and splits. It is hard and heavy, and difficult to cut, weighs from 55 to 62 lb per cubic foot. "Casuarina seems to coppice well, and undoubtedly is, in suitable localities, and considering its extremely quick growth and the qualities of its wood, one of the most important trees we have for fuel and other plantations" (*Gamble*). 'The wood is used for fires, as it burns readily, and the ashes retain the heat for a long time. It is much valued for steam engines, ovens, &c" (*Treasury of Botany*). Clubs made of the hard wood are used in Fiji for beating the bark of the PAPER MULBERRY (*Bronssonetia papyrifera*, Vent) for the manufacture of Tapa cloth (*Kew Official Guide to Museums*, 121). The natives of Australia make their war-clubs from this wood (*Smith*)

DYE

MEDICINE.
830TIMBER
831DOMESTIC
Ash
832

Catechu, see—

[A 139] (a) *Acacia Catechu*, Willd., *LEGUMINOSÆ* (black catechu)

(b) *Ucacia Gambier*, Roxb., *RUBIACEÆ* (pale catechu)

[A 1298] (c) *Areca Catechu*, Linn., *PALMÆ* (palm catechu)

Cattle and Buffaloes, see Oxen

Cat, Civet, see Tigers and Panthers.

Catha. Several species exist in India, but by the *Flora of British India* they have been all reduced to *Celastrus*, which see

Catha edulis yields the *Kat* or *Kafter* of the Arabs, the leaves of which if chewed are said to prevent sleep. Sometimes imported into India, largely so to Aden, where they are used as a substitute for Tea.

833

Cat's-eyes, see Chalcedony.

Cat's-skins, see Skins.

Cauliflower and Brocoli, see Brassica (oleracea) botrytis B 851

Caustic Potash, see Potassium, also Carbonate of Potash, C. 577

Caustic Soda, see Sodium, also Carbonate of Soda

CEDRELA, Linn., Gen Pl. I. 339

834

The *Flora of British India* has reduced at least three if not four easily-recognisable trees to one species not even retaining the old specific names to denote varieties. If dried specimens in the Herbarium do not exhibit the characters of the *Cedrelas*, there is no mistaking the living plants. *C serrata*, Royle, is so dissimilar from *C Toona*, Roxb., that were they to be found growing side by side, through the aid of a glass, they could be distinguished miles off. The former is a sparsely branched tall tree, with palm-like clusters of pale green leaves, at the ends of its ascending branches, from which when in flower a panicle three or four feet long is suspended. This is the characteristic form of the North-Western Himalaya at altitudes from 4000 to 8000 feet. It frequents damp shady streamlets, growing so gregariously as to exclude all other trees

CASUARINA
equisetifolia.

Beefwood of Australia.

826

CASUARINA, *Forst.*; *Gen. Pl.*, III., 402.
Casuarina equisetifolia, *Forst.*; *DC. Prodr.*, XVI., 2, 338; CASU-
THE BEEFWOOD OF AUSTRALIA. [ARINACEÆ.Syn.—*C. MURICATA*, Roxb., *Fl. Ind.*, Ed. C B C., 623.Vern.—*Yangli saru*, HIND; *Yau*, BENG; *Vilayatisaro*, *vilayati saré*, *saroka jhar*, BOMB; *Jurijur*, *mujjun*, SIND; *Sarpukhala*, *sarova*, *suru*, *MAR*; *Yanglihdá*, *jangli-saru*, *jangli-saru-chal*, *BUK.*; *Chouk*, *shavuku-maram*, *shavuku-pattay*, *TAM*; *Seroa*, *chavuku-moná*, *chavuku-patta*, *TEL.*; *Kdsrúke*, *MYSOR*; *Sura*, *KAN.*; *Aru*, *chavuka-maram*, *MALA.*; *Tin-yu*, *BURM*. Many of the Indian names are modern adaptations; Conf. with *Tamarix*.References.—*Gamble*, *Man. Ind.*, 365; *Brandis*, *For. Fl.*, 435; *Kurz*, *For. Fl.*, *Burm.*, II., 404, *Dals. & Gibs*, *Bomb. Fl.*, *Suppl.*, 82; *Pharm. Ind.*, 317; *Moodeen Sheriff*, *Suppl. Pharm. Ind.*, 26; *Dymock*, *Mat. Med. W. Ind.*, 2nd Ed., 750; *Ainslie*, *Mat. Med. Ind.*, II., 443; *Murray*, *Drugs and Pl.*, *Sind.*, 27; *Liotaud*, *Dyes of India*, 10; *Wardle*, *Dyes of India*, I., 45; *Bidie*, *Cat. Raw Prod.*, *Paris Exh.*, 44; *S. Arjun*, *Bomb. Drugs*, 131; *Drury*, *U. Pl.*, 124; *Baden Powell*, *Pb. Pr.*, 573; *Lisboe*, *U. Pl. of Bomb.*, 132; *Kew Cal.*, 121; *Hutchins*, *Report on*, 14 *Madras*, 1883; *Report*, *Agr. Dept.*, *Madras*, 1878-79, pp. 38-39; *Balfour*, *Cyclop.*; *Smith*, *Dic.*, 294; *Treasury of Botany*.Habitat.—A large, evergreen tree, with leafless, drooping branches and branchlets, which are deciduous, and perform the functions of leaves. Found on the coast of Chittagong, Burma, the Malay Archipelago, North Australia, and Queensland, cultivated all over India, except in the north-western portion of the Panjáb. Thrives best in the sandy tracts near the sea-shore. Introduced into the plains of India as a road-side tree (valuable on account of the rapidity of its growth) about the beginning of the present century, and from its resemblance to the *Tamarix* received the vernacular names of that plant.Cultivation.—“It has been largely planted in North Arcot, South Arcot, Madras, and other districts of the Madras Presidency, for fuel, for which it is excellent, but it requires to be near the sea-coast and to have water at the roots, at least 10 feet from the surface of the ground. Trees planted in sandy soil often suffer much from drought the first two or three years, the tap-root then finds its way down to about 10 feet, and reaching water the tree begins to thrive. It is of course best near the sea, but fine trees may be seen in places in Northern India, especially at Saharanpur and Amballa” (*Gamble*).

The Madras Agricultural Report for 1878-79 gives particulars of the cost of cultivation of an acre containing 1,200 trees. The initial cost is put down at Rs 5; with interest at 10 per cent. for four years this raises the gross capital to Rs 19. At this time half the trees (600) should be removed. Valuing these at 8 annas each the capital is returned and a balance left of Rs 1. Two years later another 200 trees are removed, worth Rs 1 each, and in the eighth or ninth year the land may be cleared; the remaining trees, at the lowest estimate, after paying all expenses on the same, would realize Rs 600.

Gum.—Reported to yield a good resin.

Dye.—The bark is used in tanning (*Birdwood*, *Bomb. Prod.*, and *Bidie*, *Mad. Exh. List for 1855*). A brown dye is extracted from it according to Balfour. Mr Wardle remarks, “The bark contains a small quantity of colouring matter, and produces in dyeing light-reddish drab colours on each of the fabrics on which I have experimented.” He further adds: “The shades produced by this dye-stuff are very goodCULTIVATION
827GUM.
828
DYE
829

Cedrelas or Toon woods

CEDRELA.

though faint, but the dye-stuff contains too small an amount of colouring matter to be of any great value in the dye house' Lisboa says that it is used in Bombay as a mordant

Medicine—The bark is slightly astringent, and is employed in infusion as a tonic, according to Dr Gibson it is an excellent and at the same time a readily available astringent, useful in the treatment of chronic diarrhoea and dysentery (*Murray*)

Structure of the Wood—White, brown near the centre, very hard, it cracks and splits. It is hard and heavy, and difficult to cut, weighs from 55 to 62 lb per cubic foot "*Casuarina* seems to coppice well and undoubtedly is, in suitable localities, and considering its extremely quick growth and the qualities of its wood, one of the most important trees we have for fuel and other plantations" (*Gamble*) "The wood is used for fires, as it burns readily, and the ashes retain the heat for a long time. It is much valued for steam engines, ovens, &c" (*Treasury of Botany*) Clubs made of the hard wood are used in Fiji for beating the bark of the *PAPER MULBERRY* (*Broussonetia papyrifera*, *Vent*) for the manufacture of Tapa cloth (*Kew Official Guide to Museums* 121) The natives of Australia make their war-clubs from this wood (*Smith*)

Domestic Uses—'The burnt ash is made into soap' (*Smith*)

DYE

MEDICINE.
830TIMBER
831DOMESTIC.
Ash
832

Catechu, see—

[A 139] (a) *Acacia Catechu*, *Willd*, LEGUMINOSÆ (black catechu)

(b) *Uncaria Gambier*, *Roxb*, RUBIACEÆ (pale catechu)

[A 1298] (c) *Areca Catechu*, *Linn*, PALMÆ (palm catechu)

Cattle and Buffaloes see *Oxæ*

Cat, Civet, see *Tigers and Panthers*

Catha. Several species exist in India, but by the *Flora of British India* they have been all reduced to *Celastrus*, which see

Catha edulis yields the *Kat* or *Kafter* of the Arabs, the leaves of which if chewed are said to prevent sleep. Sometimes imported into India largely so to Aden, where they are used as a substitute for Tea.

833

Cat's-eyes, see *Chalcedony*

Cat's-skins, see *Skins*.

Cauliflower and Brocoli, see *Brassica (oleracea) botrytis* B 851

Caustic Potash, see *Potassium*, also *Carbonate of Potash*, C 527

Caustic Soda, see *Sodium*, also *Carbonate of Soda*

CEDRELA, *Linn*, *Gen Pl*, I, 339

834

The *Flora of British India* has reduced at least three if not four easily recognisable trees to one species not even retaining the old specific names to denote varieties. If dried specimens in the Herbarium do not exhibit the characters of the *Cedrelas*, there is no mistaking the living plants. *C serrata*, *Royle*, is so dissimilar from *C Toona*, *Roxb*, that were they to be found growing side by side through the aid of a glass they could be distinguished miles off. The former is a sparsely branched tall tree, with palm-like clusters of pale green leaves, at the ends of its ascending branches, from which when in flower a panicle three or four feet long is suspended. This is the characteristic form of the North-Western *Himálaya* at altitudes from 4000 to 8000 feet. It frequents damp shady streamlets, growing so gregariously as to exclude all other trees

C. 834

**CEDRELA
serrata.****The Toon woods.**

In the Monograph of the Meliaceæ published in 1878 by Oosimir de Candolle, the species of *Cedrela* formerly grouped under the one head of *Cedrela Toona*, Roxb., have been separately described.

They are thus distinguished:—

Ovary glabrous—

Leaflets petioled *C. serrata*, Royle

Leaflets subsessile *C. glabra*, *C. de Cand.*

Ovary hairy—

Leaflets acute at the base *C. Toona*, Roxb

Leaflets round at the base *C. microcarpa*, *C. de Cand.*

Mr. Gamble, in his *Manual of Timbers*, XII., remarks that in his "*Trees, Shrubs, and Climbers of the Darjiling District*, three varieties were spoken of and separated as follows:—

No. 1.

No 2

up to 4,000 feet.

No 3 Evergreen; flowering June; fruiting November-December; bark light-reddish brown, exfoliating in long flakes, found in the upper hills from 5,000 to 7,000 feet and of great size.

"No 1 is *C. Toona*, Roxb; No 2 probably *C. microcarpa*, *C. de Cand.* It would, however, have to be distinguished from *C. microcarpa* as 'deciduous in the cold season,' the rains.' There is perhaps a fifth species.

"They may also be distinguished as follows by the capsule:—

Capsule smooth . . { capsule round *C. Toona*.

 " long, pointed *C. microcarpa*.

Capsule covered with corky tubercles *C. glabra*.

"Of the Northern Bengal specimens—*E 2333* will be *C. glabra*, while *E 3623* will be *C. microcarpa*. Some specimens of *C. microcarpa*.

2000 feet, is probably *C. multijuga*,

3M, Nee, KAREN (Trade name,

It has a light, soft, pink wood, with the usual characteristic scent strongly perceptible, and structure resembling that of the other species of Toon, the pores being perhaps more scantily distributed. Weight 35 lb per cubic foot."

The preceding remarks may for the present be accepted as indicating the Nepal plant, *C. glabra*, DC., and the Sikkim *C. microcarpa*, DC., as distinct from the following:—

835 **Cedrela serrata**, Royle, III, p 144, t 25; Monog, DC., I, 742; [MELIACEÆ.

Syn.—*C. TOONA*, Roxb (Hook, Fl Ind, 1, 568, in part)

Vern.—*Drawi, dalli, dal, douri, khishing, khinam*, N.-W. H.

Habitat.—Abundant in forest of the N. M.

frag large pores. -grained, numerous

C. 836

The Toon-woods.

CEDRELA
Toona.

Domestic Uses.—Used about Simla, for the hoops for sieves, for bridges, and for many such purposes. The shoots and leaves are lopped for cattle fodder.

DOMESTIC.
837
FODDER.
838

Cedrela Toona, Roxb.; Fl. Br. Ind., I., 568; Wight, Ic., t. 161.

THE TOON OR INDIAN MAHOGANY TREE; MOULMEIN CEDAR.

Vern.—Tūn, tūn, lūn, mahā-nīm, mahā-limbo, tūnkā-jhār, tūna, lūd,
Tippura; Somo, BHUTIA;
lun, SATPURA; Drawl,
chūti-girin, der, dori,
Tūni, babuch, lahchi.

TEL; Arana-maram, MALA; Suli, māli, SALEM; Kal kilingi, NIV-
GIRI; Sandam cembu, TINNEVELLY; Tundā, kempā gandagheri,
tunda, sonula-mara, kandagariga-mara, dardari, KAN; Nogā, brandi,
COORG; Tunna, kuberaka, kachla, nandi-rishā, tunna-kuberaka,
SANS; Chikado, tsikado, MAGN, Shurusbedi, CHAKMA, Thit-kadoe,
BURM.

References.—Roxb, Fl Ind, Ed. C B C, 213, 633, Brandis, For, Fl,
72, Kura, For, Fl, Burm, I, 228; Bedd Fl. Sylv, t. 10; Gamble, Man,
Timb, 77, 79, 211; Dala & Gibs, Bomb, Fl, 38; Stewart, Pb. Pl.,
34; Aitchison, Cat Pb Pl, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55; Moodie
Met. Hind, 31
Ainslie, Mat Ind
Powell, Pb. Pr., 3
Dyer, Et., Ind.,
Tans of Beng.,
wood, Bomb Prod, 325, Lisboa, U Pl Bomb, 4, 241, 248, Balfour,
Cyclop, Treasury of Bot, Kew Cat, 29, Fleming's Med. Pl. and
Drugs in As Socy Res, Vol XI, 163, Med. Top, IV, 53

Habitat.—A large tree, about 50 to 60 feet in height, growing in the
tropical districts of the N. and A. Indies. Distributed to Java

Gum.—It yields a resinous gum, of which little is known at present.

M. Nees von Essenbeck has published an account of some experi-
ments with the bark, which indicate the presence in it of a resinous
extract.

GUM.
839

engal generally
must be to a small extent only, since Dr. Bidie omits it from his list of
Madras dyes sent to Paris. The flowers are boiled to extract the colour
which is known as *basauti* in the North-West Provinces.

DYE.
Flowers.
840
Seeds.
841

used as a dye-stuff at Palamau. Apparently *Toona* is not used with mordants,
and is rarely combined with other dyes. The sulphur yellow of
Cawnpore is produced from tun, turmeric, lime, and acidulated water.
It was a commoner practice under the rulers than it appears to be now
to wear *basauti* red clothes in the spring, whence its name *basauti*
or spring time. *Saflower* and *tun* are combined in *Tunna*. Dr. McCann

C. 841

CEDRUS
Deodara.

The Deodar or Himalayan Cedar.

MEDICINE
848

remedy for ulcers and eruptions, for mange in horses and sore feet in cattle" (*Gamble, 406*)

Medicine.—The aromatic wood is employed medicinally as a carminative, diaphoretic, diuretic, and useful in fever, flatulence, inflammation, dropsy, urinary diseases, medicines (*U. C. Dut*), coarse, very fluid kind of

The oil also enters into nos-
leprosy. Dr. Gibson re-
effective in this disease,
case of *lepra mercurialis*
cedar oil. It has been

remarked that a drachm of the oil was as large a dose as the patient's stomach could bear. Its use may be extended to other skin diseases with advantage. Dr. Royle states that the leaves and small twigs of the *Deodara* are also brought down to the plains, as they are supposed to possess mild terebinthinate properties (*Plam Ind*). In Kangra the wood is pounded with water on a stone, and the paste applied to the temples to relieve headache. Assistant Surgeon Sakham Arjun describes the wood as a bitter stomachic, useful in fever, costiveness, piles, and pulmonary complaints.

Food.—The young shoots and plants are eagerly browsed by goats, &c

FOOD.
849
TIMBER.
850

Structure of the Wood.—Heartwood light-yellowish brown, scented, moderately hard. In each annual ring the outer belt of firmer and darker coloured tissue is generally narrow, and the inner belt is not very

certain conditions which have not
nd spongy. This peculiarity has
with the altitude, as fast-grown
trees possess hard tissue in the spring wood. Medullary rays fine and very fine, unequal in width, as in *Pinus*, but the resin exudes from the naked eye. On the edge of certain an concentric strings of dark-coloured pores or intercellular ducts, which are prominent on a vertical section as dark lines, and in the vicinity of which the wood is sometimes more resinous.

In common with most species of the Order, the *Deodar* has well-marked annual rings which, there is little, if any, reason to doubt, each represents the growth of a year. More information has, perhaps, been collected on the subject of the rate of growth of *Deodar* than of any other species of

such complete series of trees of
near for the question of
age of *Deodar*, specially
in attitude, is very much, considering that some

The Oleum Nigrum.

CELASTRUS
paniculata

inner Himálaya, having usually the age of trees 6 feet in girth above 140 years;

2nd—Those in the intermediate ranges and valleys, having 6 feet in girth for an age of between 110 and 140 years;

3rd—Those in the outer ranges under the full influence of the monsoon, and having the age of trees 6 feet in girth usually below 110 years

Deodar wood is extremely durable, being by far the most durable of the woods of the Himálayan conifers. It is the chief timber of North-West India, and is used for all purposes of construction,—for railway sleepers, bridges, and even for furniture and shingles. (*Gamble*)

CELASTRUS, *Linn.*; *Gen Pl*, I, 364.

TIMBER

851

Celastrus emarginata, *Willd.*; CELASTRINEÆ

Syn.—GYMNOSPORA EMARGINATA, *Roth*, in *Fl Br Ind*, I, 621, CELASTRUS EMARGINATA, *W. and A. Pro1*, 160; *Roxb*, *Fl Ind*, Ed C B C, 208, CATIA EMARGINATA, *G Don*.

852

C. oxyphylla, *Wall*

Syn.—GYMNOSPORA ACUMINATA, *Hook f*; *Fl Br Ind*, I, 619

853

C. paniculata, *Willd*; *Fl Br Ind*, I, 617; *Wight, Ic.*, t. 158.

854

BLACK OIL; THE OLEUM NIGRUM PLANT.

Syn.—CELASTRUS ALNIFOLIA, *Don*, C DEFENDENS, *Wall*; C. MULTIFLORA and NUTANS, *Roxb*

Vern—*Mal kangni mál kungí*, HIND, *Santhú, santhú* (leaves, kotaj, kuter), PU, *Malakani*, OUDH, *KUMAOY*, *Mal kangni*, BENG, *Kujari*, KJRI, SANTAL, *Kujari*, KOL, *Chiron*, MAL (S P), *Aakundan rangul*, WAHRANGUR, C P, *Kanguni mal kangni* DOM, *Mallangana* GUJ; *Malkángóni*, *mal kangonitla*, *kangan*, *pixari*, MAR; *Kugim*, LEPCHA; *Atiparich cham*, *talulrai*, TAM, *Mallanguni vittulu*, *Kuntlu-medá*, *barungie*, *maneru*, *moverikato*, *manyala erikut*, TEL, *Valu-shuta*, MALA; *Kariganne*, KAN, *Jio ikmati*, SINS, *Myin khaung-na-yung*, BURM. The vern names of *Oleum Nigrum*: *Malkangni ka-jantar*, UK; *Valulurá tailam*, TAM, *Málkanginitai'am*, TEL.

References.—*Roxb*, *Fl Ind*, Ed C B C, 209, *Brandis*, *For. Fl*, 82; *Kurz*, *For Fl Burm*, I, 212, *Gamble*, *Man Timb*, 86, xiii; *Thwaites*, *En Ceylon Pl*, 72 *Dals & Gibs*, *Bomb Fl*, 47, *Stewart*, *fb fl*, 40,

CELASTRUS
paniculata.
The Oleum Nigrum.
OIL.
855

Habitat.—A scandent shrub of the outer Himalaya, from the Jhelum to Assam, ascending to 4,000 feet; Eastern Bengal, Behar, South India, and Burma; in Ceylon it is common to 2,000 feet.

The fruit is green, or yellow oil, used medicinally. It has been kept a short time, and when mixed with sulphuric acid it turns of a dark bistre colour. It is much admired as an external application along with a poultice of the crushed seeds. It is also burnt in

MEDICINE.
Oil
856

or black bottles, each containing about $\frac{1}{4}$ oz., at prices from 12 annas to one rupee a bottle.

Medicine.—The red seeds are used medicinally, principally for cattle. They are given in rheumatism and paralysis. An empyreumatic oil is obtained from the seeds by a rude form of distillation, which is applied externally. This oil, under the name of "Oleum Nigrum," was brought forward by the late Dr. Herklots as a sovereign remedy in *beri-beri*. When administered in doses of from ten to fifteen drops twice daily, its action as a powerful stimulant is generally followed in a few hours by free diaphoresis not attended by exhaustion. It is specially efficacious in recent cases and here the seeds are used.

(Bade)

Dr. N.

oil.

Seeds
857

aphrodisiacal and stimulant, useful both as an external and internal remedy in rheumatism, gout, paralysis, leprosy, and other diseases which are supposed to be caused by cold humors in such cases commencing with a dose increased to fifty by daily increments of 5. It may be applied externally, or the crushed seeds combined with aromatics. The latter application is said to be very efficient in removing local pains of a rheumatic or malarious nature" (*Dymock, Mat. Med. W. Ind., 144*). Stenward says the seeds are used medicinally "as a remedy for the seeds."

Leaves.
858

use the oil in disorders of the stomach.

The oil is obtained from the seeds, which is different from the oil of the same seeds extracted by compression. The former is black and thick, with a strong and peculiar aromatic smell; and the latter, yellow and of the consistence of oil. The black oil manufactured at Calcutta is the best. It is a good diuretic, dia-

phoretic, and the best remedy for *beri-beri*. It is used under the use of other medicines when this oil was employed. The first good effect of this medicine is generally the increase in the quantity of urine, and with this the dropsical effusion begins to disappear. A redness is also noticed in some cases later than this period. Diuretics invariably enjoin a

C. 858

The Oleum Nigrum

CELASTRUS
senegalensis,

patient except milk and bread—a restriction which is as injurious as un-
requires
rum in
and en-
5 to 15
Surgeon

MEDICINE

Moodeen Sheriff, Khan Bahadur, Triplicane, Madras). "The seeds boiled
in milk are used by natives in nervous affections. They are also used
as food for quails" (Assistant Surgeon Bhagwan Dass, Rawal Pindi,
Panjab) "Said"

Food for
Quails.

in impotency, but
McKenna, Cawnp
by distillation fro
or three times a

patient is under this treatment he should eat meat roasted. I have seen
two or three cases of *beri-beri* cured by this treatment, and have also
given it, with a fair amount of success, in dropsy from anæmia" (Surgeon-
Major Lionel Beech, Cocanada) "The juice of the leaves mixed with
that of the leaves of *Hydrocotyle asiatica*, and powdered spikenard, is
considered a cooling application in inflammatory brain affections" (Assis-
tant Surgeon Sakharam Arjun, Bombay) "The 'black oil' obtained by

diet should be observed, chiefly of wheat, *chappatties*, with fried meat,
and milk, and nothing else should be taken. Is an invaluable remedy
among the people of the Northern Circars, especially of those of the
malarious tracts" (Surgeon-Major E W Levinge, Rajamundry, Godavery
District) "Said to be useful as an aphrodisiac" (Surgeon-Major D R
Thompson, Madras)

Structure of the Wood.—Pinkish yellow, soft

TIMBER.
859
860

Celastrus senegalensis, Lam

Syn — GYMNOSPORIA
621, C MONTANA,

Vern — Sherawane, 7
kharai, Pb, Bask
babur, GOND, Dha
pedda chintu, TEL

References — Roxb Fl. Ind, Ed C B C, 208, Brandis, For Fl 81,
Aurs, Fl Burm, I, 252, Beddome, Fl. Sylhet, LXVI; Dalt & Gibs,
Bomb Fl, 48, Gamble, Man Timb, 87

Habitat.—A profusely-armed tall shrub, common in the northern dry
and intermediate zones of Central, South-Western, and North-Western
India, distributed to Afghanistan, Central Asia, and Australia. The
Flora of British India distinguishes several forms. *C. montana*, Roxb,
comprises those forms which have the branches less profusely armed, and
the leaves larger and broader, *C. senegalensis*, Lam, those in which the
stems are more robust, and profusely armed, and the leaves smaller and
narrower

Medicine — The BARK, ground to a paste and applied to the head, with
mustard oil, is said to destroy *pediculi*

MEDICINE.
Bark
861

C. 861

CELOSIA
argentea.

Celestite; Celosia.

862

Celastrus spinosus, Royle.

Syn.—GYMNOSPORA ROYLEANA, Wall., as in Fl. Br. Ind., I, 620.
 Vern.—*Yaliddhar*, HIND, *Dsaral*, TRANS INDUS; *Kandu*, *kamla*,
kandiari, *kander*, *lāh*, *patāki*, *lei*, *h*, *phāpārī*, *badlo*, *kadewar*, *Pā*;
 able,

Habitat.—A thorny, distorted bush, abundant on the outer North-Western Himalaya (Kumaon and Garwhal, altitude 1,000 to 4,500 feet) and distributed to the Concan and thence to Afghānistān, common on the Salt Range at about 5,000 feet in altitude.

Medicine.—In the Salt Range the smoke from the SEEDS is said to be good for toothache.

Structure of the Wood.—Lemon-coloured, hard and close-grained; weight 49 lb a cubic foot. Gamble says the wood deserves attention as a possible substitute for boxwood, for carving and engraving. Baden Powell remarks that it is used in the Panjāb for walking-sticks.

MEDICINE

Seed.

863

TIMBER

864

865

Celery. See *Apium graveolens*, Linn.; UMBELLIFERÆ.

Bombay.

866

CELESTITE; Mallet, Mineralogy, 141.

Celestite or Celestine is a natural mineral, found in rhombic or

Panjab

867

the Salt Range.

CELOSIA, Linn.; Gen. Pl., III., 24.

For botanical characters of the genus see under *Amarantaceæ* (A. 914).

The name is derived from *kelos*, burnt, in reference to the colour of the flowers in the common garden species.

868

Celosia argentea, Linn.; Fl. Br. Ind., IV., 714; AMARANTACEÆ.

V.

names imply white-cock's-comb

References.—Roxb., Fl. Ind., Ed. C B C., 229; Thwaites, En Ceylon Pl., 257; Dals & Gibs, Bomb. Fl., 215; Stewart, Pb. Pl., 181; Aitchison, Cat. Pb. Pl., 130; Murray, Drugs and Pl. Sind., 100; Baden Powell, Pb. Pr., 373; Lushoo, U. Pl. Bomb., 170; Balfour, Cyclop.

Habitat.—An abundant weed of the fields in Central and Northern India (from Chutūr Nagpur to the Panjāb), occasionally ascending to altitude 5,000 feet in the Himalaya, it is also met with in the warmer parts of Ceylon. It appears very commonly in the monsoon season.

Medicine.—The SEEDS are official, being an efficacious remedy in diarrhoea. The Rev. A. Campbell says the Santals extract a medicinal oil from them.

Food.—The plant is used as a pot-herb in times of scarcity, and is eaten by cattle, especially buffaloes.

MEDICINE

Seeds.

869

Oil.

870

FOOD.

871

FOODER

872

C. 872

Celosia; Celsia.

CELSIA
coromandeliana.*Celosia cristata*, Linn; *Fl. Br. Ind.*, IV., 715; *Wight, Ic.*, t. 730.

873

Vern.—*Kokan*, *pila-murghka*, *idi-murghka*, HIND; *Mawal*, *taj*, *choros*, *bostan afra*, *kanyu*, *dhur-dre*, PB; *Mawal*, KASHMIR; *Lal murga* (the red form), *haldi murga* (the yellow), BENG; *Erra kodu-utta totakuru*, *kodi juttu-tota-kura*, TEL; *Mayur ankha*, SANS; *Kyel-monk*, BURM.

References.—*Roxb*, *Fl Ind*, Ed C B C, 228; *Dale & Gibs*, *Bomb Fl*, 215; *Stewart*, *Pb Pl*, 182; *Murray*, *Drugs and Pl*, *Sind*, 101; *Baden Powell*, *Pb Pr*, 373; *Balfour*, *Cyclop.*; *Treasury of Botany*; *Spons*, *Encyclop*, 938

Habitat.—Cultivated as an ornamental plant in the plains, and on the Himalaya, Kashmir (5,000 feet). In *Spons' Encyclopædia* occurs the remark that this plant is "Common all over Bengal and Northern India generally."

Fibre.—"It yields a strong flexible fibre, so highly esteemed that rope made of it sells at five times the price of jute rope." Confirmation of this fact is much required, and also samples of the plant from which the fibre has been extracted. It is known in Bengali as *Lal-murga*, but Roxburgh makes no mention of the fibre, indeed, with the exception of the notice in *Spons' Encyclopædia* quoted above, no author, as far as the writer can discover, alludes to the fibre.

Medicine.—The FLOWERS are officinal, being considered astringent; they are used in cases of diarrhoea and in excessive menstrual discharges. The SEEDS are viewed as demulcent.

Special Opinion.—"Seeds demulcent and useful in painful micturition, cough, and dysentery" (*Dr. U C. Dutt, Serampore*).

Food.—Cultivated in gardens—both the red and the yellow forms—on account of the stem, which is eaten as a pot-herb. Professor Church (in *Food-Grains of India*) is apparently in error when he speaks of the food properties of the seeds of this plant. The writer can find no mention of the plant being cultivated on account of its seeds, nor indeed of these being eaten. Besides, three of the vernacular names given by the Professor are not names for this plant. *Sil* (and names derived from that word) are more correctly applied to *Amarantus paniculatus*, the seed of which is eaten, so that it seems probable Professor Church's account of *Celosia cristata* should be transferred to *Amarantus paniculatus*.

FIBRE.
874MEDICINE.
Flowers.
875
Seeds.
876FOOD.
877CELSIA, Linn, *Gen Pl*, II, 929.*Celsia coromandeliana*, Vahl, *Fl. Br Ind*, IV., 251. *Wight, Ic.*, t. 1406, SCROPHULARINEÆ.

878

Vern.—*Kutshima*, *Lokum*, BENG; *Autli*, *Mar*; *Aniskala*, SANS

References.—*Roxb*, *Fl Ind*, Ed C B C, 421; *Thwaites*, *Fl Ceylon*, 217; *Dale & Gibs*, *Bomb Fl*, 174; *Aitchison*, *Cat Ed Pl*, 1-53; *Legt*, *Hort Sub Cal*, 47; *Tharm Ind*, 121; *Madras Sherv*, *Supp Pharm Ind*, 67; *U C Dutt*, *Mat Med Hind*, 38; *Dymock*, *Mat Med W. Ind*, 418; *S Arjun*, *Bomb Drugs*, 161; *Druy*, *U. Pl*, 126; *Balfour*, *Cyclop*

Habitat.—An herb found throughout India, from the Panjab to Pegu and Ceylon, ascending to 5,000 feet in altitude. It generally appears during the dry season as a weed, on garden or cultivated lands.

Medicine.—The inspissated juice of the leaves has been prescribed in cases of acute and chronic dysentery. It acts as a sedative and astringent. (*Pharm of Ind*)

Special Opinions.—"Juice of the whole plant, including the root, leaves, and stem, squeezed out by pounding it, is used in half drachm doses, morning and evening, in cases of symptomatic eruptions. The juice of

MEDICINE.
Juice
879

The Nettle-trees.

CELTIS
cinnamomea.

References.—*Brandis, For. Fl.*, 428, 429; *Gamble, Man. Timb.*, 344; *Stewart, Pb. Pl.*, 209; *Aitchison, Cat. Pb. Pl.*, 139; *Baden Powell, Pb. Fr.*, 574; *Balfour, Cyclop.*

... edy in amenor-

Food.—The FRUIT, a small drupe, is eaten by the natives, who regard

... Structure he has "been

Pl., 209).

Celtis cinnamomea, *Lindl. ; Kurz, For. Fl. Burm.*, II., 472.

Syn.—*C. dysodoxylon*, *Thw.*

Vern.—*Gérenda*, *SING.*

References.—*Gamble, Man. Timb.*, 343; *Thw., En. Ceylon Pl.*, 251; *Trimen, Cat. Ceylon Pl.*, 83; *Dymock, Mat. Med. W. Ind.*, 748.

Habitat.—An evergreen tree, frequent in the forests of the Eastern Peninsula, from Assam and Chittagong to Pegu and Martaban; also common in Ceylon and the Malayan islands.

Medicine.—A light-brown wood, sold in India under the name *Narakya-ida* (or Hell's Incense), is used as a charm against evil spirits. This was described by Dr. W. Dymock in the 1st edition of his *Materia Medica of Western India* under its vernacular name. The writer's attention having been drawn to this, a correspondence was instituted. Dr. Dymock stated that the *Pombas* (a name from *Celtis*) was then made received: "I see of the wood. T colour of the wood

FIBRE.
887
MEDICINE.
Fruit.
888
FOOD.
Fruit.
889
TIMBER.
Fuel.
890
DOMESTIC.
CHARMS.
891
Sandals.
892
893

MEDICINE.
Wood.
894

... ice of its
... persons
... pale grey
... in India.
... Dr. Dy-

... additional information regarding the wood and under the name of *Celtis dysodoxylon*.

... ing people as *pudacarpa*.

... by the Dutch *strunthout*, as

... its disgusting odour, which

... larger branches. The smell

... ordure, that one cannot per-

When the tree is rasped and the raspings are sprinkled with water, the stench is quite intolerable. It is nevertheless taken internally by the Singalese as an efficacious remedy. When scraped fine and mixed with lemon juice it is taken internally as a purifier of the blood in itch and other cutaneous eruptions, the body being at the same time anointed with it externally."

Cements

CEMENTS.

CEMENTS.

904

CEMENTS, *Fr*, CEMENTE, *Ital*, *Ger*.

The term "Cement" is applied to a class of substances used for uniting two bodies, and which ultimately harden and bind them together. The following classification of these substances from *Spon's Encyclopædia* may be here given (a) Calcareous cements, (b) Gelatinous cements, (c) Glutinous cements, (d) Resinous cementing compounds, and (e) Non resinous cementing compounds. Interesting information regarding the Cements of India will also be found in *Balfour's Cyclopædia of India*. See also *Baden Powell's Punjab Products*.

(a) CALCAREOUS CEMENTS—These are of mineral origin, and are limited in number. The mixture of lime and sand is an important cement of this class which is commonly known as mortar. (See Carbonate of Lime.) There are also a few called *hydraulic* cements, such as *Portland* cement, which have the property of setting or becoming hard under water. "Common lime does not possess this property, but limestones containing from 10 to 25 per cent of alumina, magnesia, and silica, yield a lime, on burning, which does not slake when moistened with water, but forms a mortar with it, which hardens in a few days when covered by water." (Page) "Portland cement is now made in Calcutta from argillaceous *kankar*, to which a fat limestone is added in the proper relation with the argillaceous constituents. Hitherto this fat limestone has been obtained

Calcareous.
905

from *Ball, Econ* published water and polishing cements." (See Cocoa nut Juice under *Cocos nucifera*.)

(b) GELATINOUS CEMENTS—These have their origin in the substance known as "gelatine" obtained by boiling animal tissues in water. It is separated from water by simple evaporation, when it is converted into a dry hard substance called by different names such as "glue," "size," "isinglass," &c according to the sources from which they are derived. Of these, "glue" and "size" are employed as cements, and in India a strong and useful glue, made from cartilage obtained from fish, is used by every jeweller and gold leaf beater.

Gelatinous.
906

(c) GLUTINOUS CEMENTS—The base of this class of cements is a sub

Glutinous
907

stances used as cements —

Adenanthera pavonina (seeds)
Ægle Marmelos (glutinous and tenacious matter)
Artocarpus hirsuta (juice)
A. integrifolia (juice)
Balsamodendron Roxburghii (gum-resin)
Bauhinia retusa (gum)
Borassus flabelliformis (juice).

Cratæva religiosa (fruit)
Diebopsis elliptica (gum)
Euphorbia Cattimandoo (milky juice)
E. Royleana (juice)
Ferona Elephantum (gum)
Tamarindus indica (seeds)
Typha angustifolia (down of the ripe fruit)

Resinous
908

CENTIPEDA
'orbicularis.

White Behen.

Resinous.

The resin from the *Sāl*, *Shorea robusta*, is employed by the Santals to repair metal cooking-pots.

See also the list of plants under India-rubber and Gutta-percha.

Non-resinous
909

(e) NON-RESINOUS CEMENTING COMPOUNDS.—The cements under this class are too numerous to be mentioned here. The reader is referred to the list given in *Spens' Encyclopædia*, pp. 626-627.

CENCHRUS, *Linn.*; *Gen. Pl.*, III., 1105.

Cenchrus catharticus, *Del.*; *Duthie, Fodder Grasses*, 15; GRAMINEÆ.

Syn.—*C. ECHINATUS*, *Rich.*

Vern.—*Bhuri*, *HIND.*; *Dhāman*, *argann*, *N.-W. P.*; *Basla*, *led*, *lapla*, *dhori*, *Pb.*; *Bharbhunt*, *JEYPORE*; *Bharout*, *AJMER*; *Kutar*, *BANDA*.

References.—*Stewart, Pb. Pl.*, 252; *Atchison, Cat. Pb. Pl.*, 163; *Murray, Pl. and Drugs, Sind*, 10, 13; *Duthie, List of Grasses, N.-W. P.*, 9.

Habitat.—*C. catharticus* is a hardy perennial grass growing in the arid ground in the plains of the

FODDER.

910

in the hot weather; nutritious shoots are given out during the hottest season (*Crooke quoted by Duthie*). By some it is considered excellent fodder, by others only middling. The seeds are eaten in times of scarcity (*Stewart*).

911

C. montanus, *Nes.*

This fodder grass is known as the *anjan* and *dhāman* in the Panjāb, and is considered by some one of the most nutritious of grasses and makes good hay.

912

CENTAUREA, *Linn.*; *Gen. Pl.*, II., 477.

Centaurea Behen, *Linn.*; COMPOSITÆ.

THE WHITE BEHEN OF WHITE RHAPONTIC.

Vern.—*Bahman safaid*, *saffaid bahman*, *HIND.*, *BOMB.*; *Behen* (or *Behen*), *BOMB.*

Ri, *BOMB. DRUGS*, *Prod.*, 42; *Balfour*,

Habitat.—A native of the Euphrates Valley. The root is largely imported into India, reaching Bombay from the Persian Gulf. It is always to be found in native druggists' shops.

CENTIPEDA, *Lour.*; *Gen. Pl.*, II., 430.

913

Centipeda orbicularis, *Lour.*; *Fl. Br. Ind.*, III., 317; *Wight, Ic.*, I., 1610; COMPOSITÆ.

C. orbicularis is a small, branched, perennial herb, with a thick, woody root, and a dense, branched, leafy stem, the leaves being opposite, ovate, and the flowers small, white, and numerous. The fruit is a small, round, blackish seed. The plant is native of the Indian Archipelago, and is cultivated in India, but the dry herb, both entire and in powder, is always to be obtained in the druggists' shops. (*Dymock, Mat. Med. W. Ind.*) "The powdered leaves are used in affections of the head, such as colds, &c., as

MEDICINE.

Seeds.

914

Leaves.

915

-C. 915

Cultivation of *Ipecacuanha*.CEPHAELIS
Ipecacuanha.

sternutatory. Boiled to a paste and applied to the cheeks, it is employed in the cure of tooth ache" (*Murray*).

MEDICINE.

Special Opinions — § "Nak-chikni, sulphur, vinegar, and the leaves
" " " " " pityriasis versicolor" (*Surgeon*—
" " " " " used for hemicrania" (*Surgeon*—
" " " " " "

CEPHAELIS, *Swartz*, *Gen. Pl*, II, 127

Cephaelis Ipecacuanha, *Rich*, *Fl. Br Ind*, III, 178, *Bot Mag*,
[4063, RUBIACEÆ

916

IPECACUANHA ROOT, *Eng*; RACINE D'IPÉCACUANHA ANNELÉE,
Fr, BRECHWURZEL, *Germ*

Syn — C EMETICA *Pers*, CALLICOCCA IPECACUANHA, *Brot*, IPECA-

Ag Hort Soc, Vol V, p 47

Habitat.—A native of Brazil, introduced into India and Burma, being cultivated at the Government Cinchona plantations with scanty success

CULTI-
VATION.

able drug. An interesting sketch of the early efforts in this direction is given in the following passages. The importance in India of ipecacuanha as a remedy for dysentery, and the increasing costliness of the drug, have occasioned active measures to be taken for attaining a supply of the drug. Several attempts have been made, but always with little success.

With regard to the acclimatisation of the plant in India, much difficulty has been encountered, and successful results are still problematical. The first plant was taken to Calcutta by Dr King in 1866, and by 1868 had been increased to 9, but in 1870-71 it was reported that, notwithstanding every care, the plants could not be made to thrive. Three plants, which had been sent to the Rungbi plantation in 1863, grew rather better, and by adopting the method of root propagation, they were increased by August 1871 to 300. Three consignments of plants, numbering in all 370, were received from Scotland in 1871-72, besides a smaller number from the Royal Gardens, Kew. From these various collections, the propagation has been so extensive, that on 31st March 1873, there were 6719 young plants in Sikkim, in addition to about 500 in Calcutta, and much more in 1874.

at Botanic Gardens, Kew,
Calcutta Botanic Garden
Islands, and also stated

C. 916

CEPHAELIS Ipecacuanha

Cultivation of Ipecacuanha.

CULTIVATION.

that "the peculiarly slow growth of this plant tends to prevent the cultivation of it from being taken up with spirit by European planters. The insignificant struggling appearance of the plant is, besides, little calculated to excite enthusiasm, or even interest, among the planting community." Mr. Cantley reported from Singapore, in 1832, that the ipecacuanha plants grown in partial shade under some trees were transplanted into pots, and the change was found to be highly beneficial to their vigorous growth (*New Reports for 1837, 1838*).

In communication with Messrs P. Lawson and Son of Edinburgh, Dr. Anderson arranged for the propagation of seedlings, and in 1870-71 had a few experimental plants sent to India. Some of these were cultivated in the Calcutta gardens and the others sent to Madras. Of the latter Colonel Beddome early reported that the higher regions of the Nilgiri hills were not found to be suitable. About this stage the Bombay Government became anxious that a consignment of plants should be furnished to that Presidency for cultivation at the Cinchona plantations at Mithibaleswar. The first definite consignment of Messrs Lawson's seedlings was entrusted to Mr. W. Walton of the Cotton Department, Bombay. The Wardian case, under the care of that gentleman, contained 12 seedlings, all of which Dr. King, in 1871, reported as having arrived in Calcutta in a healthy condition. These were sent to Darjeeling, one plant having died on the journey. Shortly after, several other Wardian cases, containing seedlings, were received at Calcutta, both from Messrs Lawson and from the late Professor Balfour, Superintendent of the Edinburgh Botanic Gardens.

From the extensive official correspondence and reports which the writer has been permitted to peruse, it would appear that the process of acclimatisation has been attended with a certain amount of success. As early as 1874, it was reported there were at the Rungbi plantation near Darjeeling 63,292 plants. These were mostly, however, small root-cuttings, and Dr. King (*Journal, Agr.-Horti Soc., 1874, Vol. V, p. 47*) wrote of them "The recent success in propagating has been entirely due to the discovery that this plant, unlike most others, can be propagated freely by root-cuttings, while from the slowness of the plant's growth, materials for stem-cuttings are yielded very sparingly. Propagation has all along been carried on in glass-covered frames and at an elevation of about 3000 feet above the sea. Our efforts have naturally been confined hitherto to increasing the number of plants, so as to get a sufficiently large stock for experiment, with the view of determining the conditions under which Ipecacuanha can be grown as a crop. The work has been carried on by the Cinchona establishment, and very little, if any, special expenditure has been incurred on its account."

"When this experiment in acclimatization was first begun, very little was known regarding the plant and the conditions required for its growth. We have now learnt from experience, that it is a humble creeping undershrub, of peculiarly slow growth, that it apparently requires a thoroughly tropical climate, by which I mean a pretty equal day and night temperature, the absence of a decided cold season and an atmosphere pretty steadily and thoroughly saturated with moisture. We have proved that it cannot stand exposure to a hot sun, and that it is apparently impatient of stagnant moisture at its roots. We do not as yet know what sort of soil best promotes the development of the root (the medicinal part), but experiments are now going on with the view of settling this point."

"As already stated, what remains to be done is to find out how to grow Ipecacuanha profitably as a crop. As a first step towards this, patches of plants have been put out at different elevations and under different

Cultivation of Ipecacuanha.

CEPHAELIS
Ipecacuanha.CULTIVA-
TION.

conditions as to soil, moisture, and shade. We have not even now a sufficiency of large enough plants to do the work on a large scale, for it must be remembered that the plants are still tiny of growth.

"In the case of the plants, it is found that the growth is very slow, and that the plants are still tiny of growth."

a matter of very great importance. Fears were freely expressed, some twenty years ago, that the supply of the drug from South America would fail, and that the price would rise in consequence. These fears have, however, fortunately not been realized, and the drug is now obtainable at pretty much the same price as twenty years ago."

better than that of Barhiyâr." The last account gives the plants in the Government plantations of South India as having increased to 700.

In the official communication from Dr King, to which reference has been made, it is stated that the plants are growing very healthy indeed, and that the advisability of growing them is proved by the fact that the plants are now being used for the purpose of seeing some plants that have been planted at Nillambore.

the letter already quoted) says "The growth is so very slow, and the protection required in the cold season is so considerable, that I found I could not produce the drug in any quantity at the usual market rate (from 100 to 150 rupees per hundred pounds)."

"I have found that the growth is so very slow, and the protection required in the cold season is so considerable, that I found I could not produce the drug in any quantity at the usual market rate (from 100 to 150 rupees per hundred pounds)."

in circumstances such as these, it may be seen that the growth of the plants is very slow, and the protection required in the cold season is so considerable, that I found I could not produce the drug in any quantity at the usual market rate (from 100 to 150 rupees per hundred pounds)."

anaha can be grown in India has been shown, but with the exception of the locality in South India mentioned above, so far no other district has been shown to afford the hope that it can become an important commercial product. There are doubtless, however, many other similar regions where it might be grown. The plant grows slowly, and has little in it to attract the attention of the cultivator, so that it may be doubted when private enterprise may be prepared to relieve the Government of its present

PROPAGA-
TION.

Medicinal properties of Ipecacuanha.

CEPHAELIS
Ipecacuanha.

CHEMISTRY.

"Emetine, discovered in 1817 by Pelletier and Magendie, is a bitter substance with distinct alkaline reaction, amorphous in the free state as well as in most of its salts; we have succeeded in preparing a crystallized hydrochlorate.

"The root yields of the alkaloid less than 1 per cent; the numerous higher estimates that have been given relate to impure emetine, or have been arrived at by some defective methods of analysis.

"Pelletier (1863) was $C^{20} H^{30} N^2 O^8$, and lastly that found in 1877

ing the powdered bark of the
isting the mixture with boiling
chloroform, petroleum benzin, or ether. It is a white powder, turning

to grains of
lime and a
few drops of water. Dry the mixture in the water bath and transfer it to
ly, then
id, and
ded will
watch-
a satu-
lution of
To the nitrate Power's test may

"If the wood, separated as exactly as possible from the bark, is used, and the experiment performed in the same way, the solution will reveal only traces of emetine. By addition of nitrate of potassium, no precipitate is then produced, but tannic acid or the potassio-mercuric iodate affords a slight turbidity. This experiment confirms the observation that the bark is the seat of the alkaloid, as might, indeed, be inferred from the fact that the wood is nearly tasteless.

Ipecacuanhic acid, regarded by Pelletier as gallic acid, but recognised is reddish brown, amorphous, to caffeotannic and kinic acids;

and a large quantity of pectin. The
and the wood more than 7 per cent, of starch (*Pharmacographia*,
p 374)

Special Opinions.—§ "Applied locally to bites of venomous insects and scorpions" (*Surgeon-Major C W Calthrop, Morar*). "With out-door patients suffering from dysentery, Ipecacuanha in large doses was found unsuited and inconvenient. The following formula in such cases was

$r \frac{1}{2}$ grain in one
alarious origin,
Surgeon Peter
efficient calm-
W. Farquhar,

Uoiacamunda).

CEPHALOSTACHYUM
capitatum.
Coccinia Indica.
CEPHALANDRA, *Schrad.; Gen. Pl., I, 827.*
919 *Cephalandra indica*, *Naud; Fl Br. Ind., II., 621; Wight, Ill., t. 105; CUCURBITACEÆ.*
MEDICINE.
Juice.
920

is directed to be taken in doses of one tola along with a pu, every morning" (*U C Dutt, Mat Med Hind*) The root, according to Moodeen Sheriff, is sold as a substitute for *labar* (*Capparis spinosa* root) in the bazars of Southern India The leaves are of a deep green colour, and are useful as a colouring agent in preparing Savine ointment from the essential oil "The root when cut exudes a somewhat sticky juice, which hardens into a reddish gum on drying, and is very astringent, but not bitter like the fruit" (*Dymock*) "The bark of the root, dried and reduced to powder, is said to act as a good cathartic, in a dose of 30 grains" (*Medical Topography of Dacca, 58*). "The LEAVES, mixed with *ghí*, are applied as a liniment to sores The whole plant, bruised and mixed with the oil of *Euphorbia perfoliata* --- --- dried cummin seeds, is administered by natives in special diseases are applied externally in eruptions of the skin gonorrhœa" (*Balfour*) "In the Conca cure sores on the tongue" (*Dymock*)

Root.
921
Leaves.
922
FOOD.
Fruit.
923

Food—"The oblong FRUIT, about 2 to 2½ inches long, green when young, scarlet-red when ripe, fleshy, smooth, is eaten both raw and --- a) The fruit is one of the com- It is eaten fresh when ripe and

924 *Cephalocroton indicum*, *Beddome, 261; EUPHORBIACEÆ.*

A common tree in the moist forests of South India (altitude 1,500 to 4,000 feet), yields a timber useful for building purposes

CEPHALOSTACHYUM, *Munro; Gen Pl, III., 1213.*

(See Vol. I., B 69, No. 9)

925 *Cephalostachyum capitatum*, *Munro; GRAMINEÆ.*

Vern.—*Gobia, gopi*, NEPAL, *Payong, LEPCHA; Silli, sullea, KHASIA.*
 Reference—*Gamble, Man Timb, 429*

Habitat.—Found in Sikkim and the Khásia Hills

C. 925

Wax	CERA alba.
<p>Structure of the wood.—The stems are 12 to 30 feet long, strong, with internodes about 2½ feet thin, yellow, used for bows and arrows by the Lepchas. It flowered in Sikkim in 1874 (Gamble)</p>	<p>FOOD Grain. 926</p> <p>TIMBER. 927</p>
<p>Cephalostachyum latifolium, Munro</p> <p>Reference—Gamble, <i>Man Timb</i>, 429</p> <p>Habitat.—A species with large leaves, found in Bhutan</p>	<p>928</p>
<p>C. pallidum, Munro, Kurz, For Fl Burm, II, 563</p> <p>Vern—Beti Ass.</p> <p>Reference—Gamble, <i>Man Timb</i>, 429</p> <p>Habitat.—A bamboo with shrubby stems. It grows in the Mishmi Hills and in Ava</p>	<p>929</p>
<p>C. pergracile, Munro, Brandis, For Fl, 567</p> <p>Vern—Tin-wo, kengwa Burm</p> <p>References—Kurz, <i>For Fl Burm, II, 564</i>, Gamble, <i>Man Timb</i>, 429</p> <p>Habitat.—A bamboo common in upper mixed forests of Burma, often gregarious. It has stems often 40 to 50 feet long</p>	<p>930</p>
CERA.	
Cera alba and flava.	
Wax (which see for further information, as also Honey)	
<p>Descriptive</p> <p>breaking wit</p> <p>like odour</p> <p>nothing to co</p> <p>Boiling water in</p> <p>blue by iodine</p> <p>light. Occurs in</p> <p>not unctuous to t</p> <p>(Ind)</p>	<p>931</p>
<p>Medicine—"Honey is emollient and slightly laxative, and is often used in cough mixtures and gargles. Wax as occasionally been prescribed in its chief use is as an ingredient in Dose of White Wax from ten to twenty grains suspended in a mixture by aid of mucilage (Pharm Ind) For further information see Bees, also Wax</p> <p>Special Opinions—"The oil is used as a liniment and is of great value in muscular and chronic rheumatism" (Surgeon Major A S G Fayer, Muskat, Arabia)</p>	<p>MEDICINE. 932</p>

CERATONIA
Siliqua.

The Carob Tree.

Ceramic Manufactures, *see* Earthen-ware.Cerasus cornuta, *Wall*, *see* Prunus Padus, *Link.*CERATONIA, *Linn.*; *Gen. Pl.*, I., 574.

933

Ceratonía Siliqua, *Linn.*; *DC. Prodr.*, II., 486; *LEGUMINOSÆ*,
THE LOCUST-TREE; THE CAROB TREE, ST JOHN'S BEAN, OR BREAD
OR LOCUST BEAN; ALGAROA of *Spain*; CARRUBIO, *It.*;
CARUBA, *Ger.*

Vern.—*Kharnûb*, *kharnûb nûbli* (the pods), *Ps.*; *Kharnûb shams* or
kharnûb nûbli, *ARAB.*

References.—*Roxb. Fl. Ind.*, Ed. C B C, 361; *Brandis, For. Fl.*, 166;
Gamble, Man. Timb., 133, 145; *Dals. & Gibb, Bomb. Fl. Suppl.*, 28;
Stewart, Bot. Ind. Ind., 133, 145; *Dals. & Gibb, Bomb. Fl. Suppl.*, 28;
Pl., 3
S. Arj
Ham
154; E
of Bot.
Duthie in Journ. Ind. Soc. Ind. Journ., 14, 101, *New Series*, 98

Habitat.—A slow-growing, evergreen tree, indigenous in *Spain* and
Algeria, the eastern part of *Asia*,
almost naturalised in the *Sai*

CULTIVA-
TION.

Cultivation—"The carob
southern coast of *Anatolia* and in *Syria*, perhaps also in *Cyrenæica*. Its
cultivation began within historic times. The Greeks diffused it in *Greece*
and *Italy*, but it was afterwards more highly esteemed by the *Arabs*, who
propagated it as far as *Morocco* and *Spain*. In all these countries the
tree has become naturalised here and there in a less productive form,

very exhaustive paper on the
abstract of all that is known on
the subject, while at the same time it deals fully with the efforts which
have in *India* been made to introduce the plant.

chi

934

ed by any extremes of temperature or excessive moisture" (*Atkin-
son, Him Dist.*, 885) Mr. G. Ricketts of *Allahabad* made experiments

Cultivation of the Carob.

CERATONIA
Siliqua.

In the Panjáb, considerable quantities of seed have been sown from as early as 1844, in the districts of Patna, Gurgaon, Rohtak, and Delhi, with little or no success. In 1872 some of the seed imported by Mr. George Ricketts were tried at Lahore and Ferozepore. The tree was found to thrive, "though it does not grow rapidly, and does not yet ripen its seed, or indeed produce pods, except in rare instances." One or two female trees existed in one of the Lahore gardens, and were cut down by the owner, Vardah Singh, probably because he did not care to be bothered by questions from the Agricultural Society as to the progress" (Stewart, *Fl. Punjab*). Mr. Ricketts was of opinion that the seeds should be well soaked before plant ing, and the trees when planted out should not be too far from each other to ensure their fruiting.

In Madras, the experiments were made in various localities, but the general result was anything but satisfactory. The seeds did not germinate in some cases, and in others, the seedlings soon died off.

In Bombay and Sind—"During the last two years, District Forest Officers in the Bombay Presidency have been engaged in carrying out experiments with carob seed, but the results do not appear to have been very promising. In Sind the Conservator states that all the plants were

CULTIVA-
TION.
935

936

937

as the plants have
in government gardens
The peculiarity of
from the female
were obtained in
if protected from

Dr Bonavia re-
ported that some of the trees attained a height from 18 to 20 feet and were
in a very healthy condition. Mr. Duthie recommends the tree should be
planted on well-drained soils.

The Lower Provinces of India
for the cultivation of Carob
reported on favourably.

facilitated by carefully peeling off a portion of the seed-coat.
The North-Western Provinces, Panjáb, and Oudh are recommended
as the best localities for the purpose; but it must be admitted that on the
whole the efforts to introduce the tree into India have not been successful.

Medicine.—Mr. Baden Powell says that the pods are used by the
people of the Panjáb for medicinal purposes. They are said by
the natives to be a good remedy for the
dysentery, and
to them as
medicinal.

Food.—The pods, full of sweet, nutritious pulp, are a common article
of food in the Mediterranean for man, horses, pigs, and cattle, and are im-
ported into the Panjáb under the name of *Kharnub-nubti* (Brandis).
They form an important constituent in the patent cattle-foods. They are
supposed to be the "husks" of the Prodigal son, and the "Locusts" of
John the Baptist.

MEDICINE.
Pods.
939FOOD.
Pods.
940

Cultivation of the Carob.

CERATONIA
Siliqua.CULTIVA-
TION.
935

or indeed produce pods, except in rare instances. One or two female trees existed in one of the Lahore gardens, and were cut down by the owner, Vandal-like, probably because he did not care to be bothered by questions from the Agri.-Horticultural Society as to their progress" (*Stewart, Pb. Pl. 63*). Mr. Ricketts was of opinion that the seeds should be well soaked before planting, and the trees when planted out should not be too far from each other to ensure their fruiting.

ities, but the
d not germi-

936

very promising. In Sind the Conservator states that all the plants were

istrict Forest
carrying out
to have been

937

slowness of growth will prevent its being of much use except as an ornamental shrub in gardens. The reports from other stations in all parts of the Presidency are of a similar nature. At some stations the plants have

overnment gardens
The peculiarity of
From the female
were obtained in
if protected from

parrots" (*Indian Daily News, 1883*).

In Oudh, the tree did remarkably well at Lucknow. Dr Bonavia reported that some of the trees attained a height from 18 to 20 feet and were in a very healthy condition. Mr. Duthie recommends the tree should be planted on well-drained soils.

938

The Lower Provinces of Bengal are, according to Dr. King, unsuitable for the cultivation of Carob, although experiments in Hazaribagh were

mination was

natives in coughs attended with much expectoration. They are said by Ainslie to be viewed as astringent. The husk of the pods has pectoral, and medicinal. The aut les to them as

MEDICINE.
Pods.
939

FOOD.
Pods.
940

CERBERA
Odollam.

The Carob Tree.

In the *Treasury of Botany* occurs the following account of Carob pods as a food stuff: "These pods contain a large quantity of agreeably-flavoured, mucilaginous, and saccharine matter, and are commonly employed in the south of Europe for feeding horses, mules, pigs, &c., and occasionally, in times of scarcity, for human food. During the last few years they have been imported into England although they form an agreeable article

price, and were used by singers, who imagined that they softened and cleared the voice. By fermentation and distillation, they yield a spirit which retains the agreeable flavour of the pod." Professor Church in *Food-Grains of India* (p. 170) states that "The nutrient ratio is here about 1:8.5, and the nutrient value 68. As sugar, pectose, gum, &c., occupy the place of starch, it flourishes in a dry

TIMBER.
041
DOMESTIC.
Seeds.
942

valued for
1 anal carat
871-1879)
onclusion

CERBERA, Linn, *Gen Pl*, II, 699

Cerbera Manghas, Linn., see *Tabernaemontana dichotom*, Roxb.,
[APOCYNACEÆ

943

C. Odollam, *Gardin*, *Fl Br. Ind*, III, 638; *Wight, Ic.* t. 441.

Syn.—C. LACTARIA, Ham, TANGHINIA ODOLLAM, LACTARIA, and LAURIFOLIA, Don

Vern.—Dabur, dhatur, BENG., Kadam, kat arali, kadalalai, kadu, Kadam, Kadam

FIBRE.
Bark.
044
OIL.
Seeds.

Habitat.—A small tree of the salt swamps, or of the coasts of India, Ceylon, and Burma, common in the South Konkan

045
MEDICINE.
Sap.
046
Leaves.
947

ent by
1883
by the
o the
is the

C. 947

Cerbera: The Yeast Plant.

CEREVISIÆ
Fermentum.

number of safe and efficient medicines of both classes is quite large enough, and there is reason for believing that this tree, even in moderate quantity, is not so poisonous. The fruit has to that degree of bitterness that it is purgative.

Special Opinions.—“The kernel of the fruit is an irritant poison, producing, when taken internally, vomiting and purging, soon followed by collapse and death” (*Surgeon-Major F. M. Houston, Travancore: John Gomes, Esq, Medical Storekeeper, Trevandrum*).

Structure of the Wood.—Grey, very soft, spongy. Annual rings marked by a sharp line; weight, 21lb per cubic foot. It is only occasionally used for firewood.

Domestic Uses.—The poisonous JUICE of the fruits was formerly used in Madagascar as an ordeal in cases of suspected crime or apostasy (*Kew Cat., 96*).

MEDICINE.

Nut.
048
Fruit.
040
Bark.
950

TIMBER.
951DOMESTIC.
Ordeal Nut.
952

Cerbera Thevetia, Linn., see *Thevetia nerifolia*, Juss.

CEREALS.

The term “Cereal” is applied to all edible grains obtained from the cereals, which are the principal cereals. OATS, INDIAN-CORN, and the reader is informed, such as the F into Cereals or Pulses, such as buckwheat, amaranthus, &c.

953

CEREVISIÆ FERMENTUM.

Cerevisiæ Fermentum.

YEAST PLANT OF TORULA CEREVISIÆ.

Reference.—*Pharm Ind*, 252.

The history of yeast is replete with interest, even although many of the details of the action of the plant in the process of fermentation are unexplainable even at the present day. There is little doubt but that the discovery of the peculiar effect of yeast upon sugary liquids, in converting these into alcoholic beverages, has been known from antiquity, and that too by the most remote and diverse members of the human family.

954

and the plant, belonging to the genus Torula.

955

latter into sugar, while the acid risen remains unchanged in quantity or

CEREVISIÆ
Fermentum.

The Yeast Plant

chemical nature In the process of beer-brewing two manifestations of the same kind are met with The grain from which the beverage is to be prepared is first moistened either with hot water or by being placed in a warm confined atmosphere As the result, it sprouts or germinates The chemistry of this action consists in the fact that in a warm moist atmosphere the simple contact of a substance known as *diastase* with the starch of the grain converts the latter into sugar Diastase may be defined as a transformed condition of gluten produced within the seed during the first stage of germination, and no sooner is the diastase formed than it immediately commences to act upon the insoluble starch This is a wise provision of nature The embryo plant is imbedded

and on being subjected to moisture, it germinates or sprouts A portion of the gluten degenerates into diastase, and the simple contact of this sub-

the infant plant feeds upon the food stored up for it within the seed. It produces first a root and then a stem, and by the time the nourishment contained within the seed has been exhausted, the root has commenced to absorb food from the soil In fermentation this curious property is taken advantage of The grain is first germinated, and when by simple contact the resulting production of diastase has converted the starch of the grain (or malt as it is now called) into sugar, the germination is stopped by the malt being dried After breaking the grain, the soluble and insoluble starch products are washed out of the husk with warm water,

It has
diastase
1,000lb
of mix-
(Com-
A. 356)
ar, the
diastase,
this, the

brewer filters the wort, for the boiling has not only killed the diastase, but has coagulated it, as also all the other albuminous matter, and by filtration the turbidity is removed

The yeast is now applied and the liquid kept for five or six days at a fixed temperature The fungus rapidly grows and multiplies. What nourishment these minute plants take has never been clearly established, but through their simple presence or contact with the sugar they cause that substance to

in the liquid

A curious

on the same

fermenting one brew with yeast reared on another. The modern system of *Pasteurising* beer by heating it in carbonic acid gas is practised with beers fermented at low temperatures These beers, containing no yeast, are clear, and are at the same time found to stand the climate of India in some respects better than the beers that used formerly to come to this country in such large quantities The yeast is killed by the process of heating to 60° In the brewing of beer only about a quarter of the fermentable substance is converted into alcohol, the remainder giving the

or *Torula Cerevisiæ*.CEREVISIÆ
Fermentum.

sweet fla
menting
tact of c
sugar produces alcohol.

It has already been said that there would appear to be other substances which similarly produce fermentation. Through the kindness of Mr. O. B. Clarke the writer received from the Khásia Hills a small cake prepared from a fungus found growing on the flowering heads of what appears to be a
used like yeast
and important
to procure tha
to endure for
suitable for baking, in
use than hitherto,
discovered at a small

957

powder prepared from the wood of an extensive climber, the ingredients being baked with a little water and s

er was not in flower, however, and he was unable to name it for certain, so that it may even prove

958

kinds
plant
y with
in this
and
A. leucopneia (the bark), the fruits of *Phyllanthus Emblica*, leaves and pods (*blang*) of *Cannabis sativa*, and *Datura fastuosa* (the seeds burned on a charcoal fire, over which empty vessels are placed to get impregnated with the poisonous smoke before being filled with date palm

and distilled. The flowers are placed in earthen vessels and mixed up with a powder produced from the barks of the following trees: *Terminalia belerica*, *T. tomentosa*, *Phyllanthus Emblica*, *Anogeissus latifolia*, *Shorea robusta*, and the roots of common rice. After a time the *mahua* ferments and is distilled, but the distiller carefully preserves the earthen vessels for future use, having discovered that if not washed out these vessels will cause the *mahua* flowers to ferment without the aid of the astringent barks. Rev. A. Campbell informs the writer that the Santals use *Ruellia suffruticosa*, Roxb (the *chaulia*), when they wish to prepare a pleasant beverage from rice, but add to this *Clerodendron serratum*, Spreng. (the *Saram lutur*), to make the beverage intoxicating. According to some authors, an alcoholic beverage is prepared from the juice of *Calotropis*

CHÆTOCARPUS
castaneæcarpus

Ceropegia: Iceland Moss

Reference.—*Balfour, Cyclop*

Habitat.—Grows in Khasi Mountains, Burma, and Tenasserim.

- 978 *Ceropegia bulbosa*, Roxb., var *escolenta*, *Fl Br Ind*, IV, 67,
[*Wight, Ic*, t. 845]

VERN.—*Akapparkadu*, HIND; *Patalatum hari*, BOMBReferences.—*Roxb Fl Ind*, *Fl C B C*, 250; *Dalé & Gibs Bomb Fl*
143; *Voigt, Hort Sub Cal* 534; *Dymock Mat Med W Ind*, 2nd
Ed, 525; *Lubbock, U Pl of Bomb*, 185; *Balfour, Cyclop*

Habitat.—Met with in the Punjab and in the Bombay Presidency.

FOOD.
Tubers.
979
Leaves.
980
Roots.
981
982

Food.—TUBERS and LEAVES are used as pot-herbs in Multan and Sind. Shepherds are fond of eating the tubers, which they consider to be tonic and digestive. "Every part of this plant is eaten by the natives, either raw or stewed in their curries. The fresh roots taste like a raw turnip" (*Roxburgh*).

- C. tuberosa*, Roxb., *Fl Br Ind*, IV, 70

..... of Roxb.

..... TEL
Bomb
1845

Habitat.—Met with in the Deccan Peninsula from the Konkan southwards.

MEDICINE.
Tubers.
983

Medicine.—"The starchy somewhat bitter TUBERS, are used as a nutritive tonic in the bowel complaints of children" (*Dymock, Mat Med W Ind*). They are also eaten. It is probable the economic information given under *C. bulbosa* and this species has been confused or is equally applicable to both plants and perhaps to one or two other species such as *C. juncea* and *C. acuminata*.

Cetaceum, see *Physeter macrocephalus*, Linn., MAMMALIAE

- 984 Cervidae, the family of the deer, of interest economically for their antlers and their skins. See "Horns" and also "Skins"

CETRARIA.

- 985 *Cetraria islandica*, Achar., LICHENES.

ICELAND MOSS

References.—*Pharm Ind*, 258; *Flück & Hanb, Pharmacog*, 737;
O'Shaughnessy Beng Dispens, 672

Medicine.—Imported into India and sold in chemists' shops

MEDICINE
986

Cevadilla or Sabadilla, see *Asagrea officinalis*, Lindl., LILIACEÆCeylon Moss, see *Gracillaria (Plocaria) lichenoides*, Greville, ALGÆCHÆTOCARPUS, *Thw*, *Gen Pl*, III, 323

- 987 *Chætocarpus castaneæcarpus*, *Thw*, *DC Prodr*, XV, 2, 1127,
[EUPHORBIACEÆ]

VERN.—*Bulholra*, BENG; *Palakuna*, *sadavaku*, TAM; *Hedika*, *Hida-waka*, SING

Chara and Nitella.

CHARA
involucrata.

References.—Kurz, *For. Fl. Burm.*, II, 479, *Gamble, Man. Timb.*, 375; *Thwaites, En. Ceylon Pl.*, 175; *Trimen, System. Cat.*, *Ceylon Pl.*, 88

Habitat.—A moderate-sized tree, found in the Khásia Hills, Eastern Bengal, Burma, the Andaman Islands, and Ceylon.

Structure of the Wood.—Light red, moderately hard, close-grained; weight 55 lb per cubic foot; used in Ceylon for building

TIMBER.
988CHAILLETIA, DC.; *Gen. Pl.*, I, 341.

Chailletia gelonoides, Hook.; *Fl. Br. Ind.*, I, 570; CHAILLETIACEÆ

989

SYN.—MOACURRA GELONOIDES, Roxb., *Fl. Ind.*, Ed. C.B.C., 254

VERN.—*Moskurra*, SILHET, HING; *Balu-nakuta*, SING.

References.—Kurz, *For. Fl. Burm.*, I, 132, *Gamble, Man. Timb.*, 80; *Held, Fl. Syl.*, 59; *Thwaites, En. Ceylon Pl.*, 201; *Trimen, System. Cat. Ceylon*, II, 17; *Dale & Gibb, Bomb. Fl.*, 52, *Lihoa, U. Pl. Bomb.*, 47.

Habitat.—A small subdeciduous tree, commonly met with in the hilly eastern parts of Bengal and Silhet, in the forests of Madras, and in the Western Peninsula on the Ghats from the Konkan southwards; it is also

000 feet.

is specially

"residency,

the value

TIMBER.
990

of the wood.

Chalcedony, see Carnelian.

Chalk, see Carbonate of Lime.

CHAMÆEROPS.

991

Chamæerops Ritchieana, Griff.; *Gen. Pl.*, III., 924; see *Nannorhops Ritchieana*; PALMÆ.

Chamois Leather, see Leather & Skins.

Chamomile or Camomile, see *Matricaria Chamomilla*, Linn.; COM-

Chánáy Kéléngu, see *Tacca pinnatifida* (?) [POSITÆ.

Chank shells, see Shells and also Pearl Fisheries.

CHARA.

Chara involucrata, Roxb.; *Fl. Ind.*, Ed. C.B.C., 648.

992

VERN.—*Jangli páti*, HIND; *Jhang*, BENG (These vernacular names are applicable to all *Charas*, indeed to most submerged plants)

Habitat.—There are a large number of species both of *Chara* and *Nitella* found in tanks and pools of water near Calcutta during the cold and hot season.

Domestic Use.—*Chara* is used as a food for cattle and horses. Atkinson (1871) is employed use this used in t finished exceedingly well."

DOMESTIC.
Clarify
sugar.
993

The Wall-flower: The White Goose-foot.

CHENOPODIUM
album.

Cheep, see Shells

Cheeronjee (chironji or chirauli) oil, see *Buchanania latifolia*, Roxb.;

Cheese, see Ghl.

[ANACARDIACEÆ

Cheilanthes tenuifolia, Sw.; FILICES.

Vern — *Nanha, dodhari*, SANTAL.

The Reverend A. Campbell writes that the Santals prescribe a preparation from the roots of this fern for sickness attributed to witchcraft or the evil eye.

CHEIRANTHUS, Linn.; Gen Pl, I., 68.

Cheiranthus Cheiri, Linn.; Fl. Br. Ind, I, 132; CRUCIFERÆ.

THE WALL-FLOWER.

Vern — *... ..*
... ..
... ..
... ..

References.—*Stewart, Pb Pl*, 13; *O'Shaughnessy, Beng Dispens*, 1861;
Drugs and Pl, Sind, 49, 5;
Med West. Ind, 2nd Ed, 56;
n Powell, Pb Pr, 327, Balfour.

Habitat.—Cultivated in gardens in North India, but is not indigenous,
 known as "Viole gialle," or yellow violets

pur
 enc

OIL.
 Flowers.
 998

MEDICINE.
 Flowers.

999
 Petals.
 1000
 Seeds
 1001

son, M B, Bijnor).

sphrodisiac" (Surgeon J. Ander-

CHENOPODIUM, Linn.; Gen. Pl, III, 51.

A genus of annual or perennial herbs, belonging to the Natural Order
 CHENOPODICEÆ (*χένυ*, a goose, and *πούς*, a foot)

Erect or prostrate herbs. Stem angled. Leaves alternate, entire lobed or
 toothed. Flowers minute, 1-5 merous. Ovary free, depressed or compressed.
 Styles 2-3. Seed horizontal or vertical, testa crustaceous, albumen floury

There are about 50 species of the genus, met with in the world. These
 are distributed in all climates. India possesses seven species, with per-
 haps numerous varieties and cultivated forms of most of these.

Chenopodium album, Linn.; Fl. Br. Ind, V., 3; CHENOPODIACEÆ.

THE WHITE GOOSE-FOOT.

Syn.—C. VIEIDE, Linn.; Roxb Fl. Ind, II, 58.

1003

C. 1003

The White Goose Song

C. 1007

FOOD
Plant.
1006
Seeds
1007

Mexican Tea: The Jerusalem Oak.

CHENOPODIUM
Botrys.

Domestic Uses.—Baden Powell says that this plant is used in the Panjab "to clean copper vessels preparatory for tinning them"

DOMESTIC.
1008

Chenopodium ambrosioides, Linn.; Fl. Br. Ind., V., 4.

1009

THE SWEET-PIGWEED; MEXICAN TEA.

Syn.—C. VALPINUM, Wall, AMBRINA AMBROSIOIDES

Vern.—Herba Santa Maria in Brazil In Chih this is known as Culen.

References.—Dals. and Gibs, Bomb. Fl. Suppl., 73; Bent. and Trim, Med. Pl., 216.

Habitat.—An old cold dal spread across the land and into

cum, from which it may be distinguished by having its flowers in leafy racemes.

Medicine.—This is said to afford an essential oil to which the tonic and antispasmodic properties of the plant are attributed. It is commonly reported that this plant is used as a substitute for the officinal C. anthelminticum, having in a milder degree the anthelmintic properties of that plant. It is employed in pectoral complaints and enjoys the European reputation as a useful remedy in nervous affections, particularly chorea. Official preparation an infusion.

MEDICINE.
OIL
1010

various species not being distinguished.

Food.—This plant affords the Mexican tea.

FOOD.
1011
1012

C. Blitum, Hook. f.; Fl. Br. Ind., V., 5

Syn.—BLITUM VIROATUM, Linn

Vern.—Sundar (J), kelpad (C), Pb

References.—Stewart, Pb Pl., 177; Von Mueller, Extra-Tropical Plants.

Habitat.—North Western India: Kashmir, altitude 8,500 feet and Western Tibet at 12,000 to 14,000 feet. Stewart found the plant wild in the Jhelam, Chenab, and Ravi basins and in the Trans-Indus at altitudes from

DYE.
1013
FOOD.
Fruit.
1014
Leaves,
1015
1016

resembles. In Ladakh the LEAVES are eaten as a pot-herb."

C. Botrys, Linn.; Fl. Br. Ind., V., 4

THE JERUSALEM OAK.

Syn.—C. ILICIFOLIUM, Griff Notul., IV., 337

References.—Dals & Gibs, Bomb. Fl. Suppl., 73

Habitat.—Temperate Himalayas from Kashmir to Sikkim, at altitudes from 4,000 to 10,000 feet. Tibet 11,000 to 14,000 feet. Stewart says it occurs at Peshawar, and Dalszell that it was originally introduced into Bombay but has now gone wild. A weed of fields.

Medicine.—Reported to be used for various purposes and to possess the same properties as C. ambrosioides. U. S. Dispensatory it has been used for the treatment of and humoral asthma. The

MEDICINE.
OIL.
1017

C. 1017

CHICKRASSIA
tabularis.

The Quinoa: The Chittagong Wood

1018

Chenopodium murale, Linn, *Fl Br Ind*, V, 4Vern — *Bdtā*, *kurānd*, *kharatua*, PbReferences — *Stewart*, Pb Pl., 178

Habitat — General in many parts of India from the Panjab to the Gangetic Valley, the Deccan, and South India

Food — Used as a pot-herb in the Panjab

FOOD

1019

1020

C Quinoa, an American species, has once or twice been tried in India, but apparently with little success (*See Church, Food Grains of India*, p 110)Cherry, see *Prunus Cerasus*, Linn., ROSACEÆ.Chestnut, Horse, see *Æsculus indica*, Colebr (A 567), and *Æ Hippocastanum*, Linn (A. 573); SAPINDACEÆChestnut, Sweet, see *Castanea vulgaris*, Lam, CUPULIFERÆChestnut, Water, see *Trapa bispinosa*, Roxb, and *T. nutans*, Linn., ONAGRACEÆCHICKRASSIA, A Juss, *Gen Pl*, I, 339

1021

Chickrassia tabularis, Ahr Juss; *Fl Br Ind*, I, 568, *Beddome*, *Fl Sylhet*, t 9, MELIACEÆ

THE CHITTAGONG WOOD

Syn — *SWIETENIA CHICKRASSIA* Roxb, *Fl Ind*, Ed C B C, 370, C NIMMONI, *Grak Dals & Gids*, Bomb Fl, 38Vern. — *Chikrassi*, *padha*, *dalmara* BENG, *Boga poma*, ASS, *Padha pudha*, BOMB, *Padha palara*, NUL, MAR, *Aglay*, *agay*, *agle marum* eleutharay, TAM, *Madagari vembu*, *chittagong chettu*, *chittagong karu*, *chela kum karra*, TEL, *Dosedah*, MALA, *Ganti malle*, SALEM, *Dalmara lal*, *devdari*, KAN, *Mafn*, HYDERABAD, *Saphra*, *sry barasi*, MAGH, *Chegarasi* CHAKMA, *Yimmah*, *yeng ma yimma nga* ARRODAH, AND; *Hulan-*Burm, I 227 *Gamble*,*Dals & Gids* Bomb*nessy*, *Beng Dispens*,resins, 13 *Atkinson*,350, *Urney*, ... *Him Dist*, 814 *Birdwood*, *Bomb Prod*, 325 *Lisboa*, *U Pl Bomb*, 45, *Balfour*, *Cyclop*, *Treasury of Botany*, *Kew Cat*, 29

Habitat. — A large tree, native of the hills of Eastern Bengal, South India, and Burma, and also found in the warmer parts of Ceylon

Gum — It yields a transparent, amber-coloured GUM, said to have been sent from Madura to the Indian Museum in 1873 (*Spons' Encycl*) Thelight brown, some-
Gum resins, 13)

GUM

1022

DYE.
Flowers.

1023

MEDICINE.

Bark.

1024

TIMBER.

1025

foot. The wood is used for furniture and is ...
gong wood of commerce, and from its fresh cedar-like smell is called *lal* or *devdari* in Kanara The wood is dark-coloured and close in the grain It is used for every purpose, and is much valued" (*Bomb Gaz*, XV, 66)

"The wood is well known in Madras and easily procured, and is extensively used in cabinet-making, coming under the denomination of

C. 1025

The Chittagong Wood: Chlorophytum.

CHLOROPHYTUM
breviscapum.

'Chittagong wood,' being imported from that district, though it is abundant in the mountainous parts of the peninsula. It is close-grained, light-coloured, and delicately veined, makes beautiful and light furniture, but is apt to warp during the season of hot land-winds. According to Dr. Gibson, it is a fine straight-growing tree, rather common in the southern jungles of the Bombay Presidency, but much less so in the northern.

wood
purpo
plane

Malabar. It is found also in the Ghâts, particularly on the coast, but tough and close-grained, known to the carpenter. It (Balfour, *Cyclop.*)

Chicory, see *Cichorium Intybus*, Linn.; COMPOSITÆ.

China Root, see *Smilax china*, L.; LILIACÆ.

Choinanthus albidiflora, Thw., see *Linociera albidiflora*, Thw.

C. zeylanica, Linn., see *Linociera purpurea*, Vahl.; OLFACIÆ.

Chirêta, see *Swerdia Chirata*, Ham.; GENTIANACÆ.

Chloride of Ammonium, see Ammonium chloride.

Chloride of sodium, see Sodium chloride.

CHLORIS, Sw.; Gen. Pl., III., 1165.

Chloris barbata, Swartz; Duthie, *Fodder Grasses*, 53; GRAMINÆ.

1026

Syn.—ANDROPOGON BARBATUS, Linn.

Vern.—Gandi, gavung, palunh, jargi, konda-pulla, N.W. P.; Ganni, jharna, Pb.; Phundi, AJMER; Prens, MERWAR; Chhikari, JY. PUR; Baridiya, phulkia, C. P.; Botya jhara, BERRAR; Konda-pulla, SOUTH INDIA, Mayil konda-pulla, TAM.

References.—Baker, *Fl. Ind. Brit. Mus.*, 1896, p. 1165. Dals & Gibe, *Fl. Ind. Brit. Mus.*, 1896, p. 319. Murray, *Pl.*

Habitat.—Very common in large tufts of which they do not seem to be used as fodder.

FODDER.

1027

C. barbata, Swartz; Duthie, *Fodder Grasses*, 53; GRAMINÆ. Vern.—Mathaniya, LAHORE; 1895, not uncommon in Northern

1028

C. tenella, Roxb., Kagya, AJMER, Morbhaga, UNDAIPUR; a grass common in Rajputana, Bundelkhand, and Central Provinces, is also considered good fodder.

CHLOROPHYTUM, Ker.; Gen. Pl., III., 788.

Chlorophytum breviscapum, Dalz. in *Kew Journ.*, II., 142, [LILIACÆ].

1029

Vern.—Bimpel, SING.

References.—Dals & Gibe, *Fl. Ind. Brit. Mus.*, 1896, p. 319; Baker, *Linn. Soc.*, XV., 331; *Treasury of Botany*, II., 1260.

Habitat.—Frequent in the Malwan District, Bombay, in rocky situations. C. Heynei, Baker, a nearly allied species, met with in the southern and central parts of Ceylon, at no great elevation.

C. 1029

CHLOROXYLON

Swietenia

The Indian Satin-wood

MEDICINE.

Bulb
1030

Medicines—Used medicinally by the Singhalese (*Thwaites, En Ceylon Pl.*, 139). There are several other species of this genus met with in India, and it seems probable their medicinal properties have been overlooked. *C. taberosum* is general throughout India, from Bombay to Prome, ascending the Himalaya to 3,000 feet in altitude. *C. nepalensis* occurs in the eastern sub-tropical Himalaya, while *C. arundinaceum* occurs on the sub-tropical Himalaya and on Patishuth in Behar, altitude 4,000 feet.

1031

CHLOROXYLON, DC ; Gen Pl., I, 340
Chloroxylon Swietenia, DC. Fl Br Ind., I, 569, Beld., Fl Syl-
vat., t 11; Wight, Ic., t 56, MELIACEÆ.

THE INDIAN SATIN-WOOD

Syn—SWIETENIA CHLOROXYLON, Roxb., *Fl Ind., Ed C B C.*, 370

Vern—*Dhaura, bhurra, gurya, Hind, Behru, bilaga, bhayrā, bheyrl, URIVA, Behra, gurya, behru, bhiru, bhurra bhirra C P, Sengel sali, KOL, Bharkul, KARWAR, Bhira GONO, Bhirwa, Baigay, Haida billa, hardi, bheria, Boma, Halda, bheria, VAR, Mudada, burus, purush-mudada, marum, purus burus, vummay, mātuda, vummāi pora-*

burute, Sika

References—*Brandis, For Fl.*, 74. *Gamble, Man Timb.*, 77. *Thwaites, En Ceylon Pl.* 61. *Dale & Gids Bomb Fl.*, 39. *Voigt Hort Sub Cal.*, 137. *Dymock, Mat Med W Ind.*, and *Ed.*, 177. *Drury, U Pl.*, 131. *Cooke, Gums and Gum resins*, 25, 115. *Atkinson Gums and Gum resins*, 34. *Atkinson, Him Dist.*, 814. *Lisboa, U Pl Bomb.*, 45. *Bal four, Cyclop Treasury of Botany, New Cat.*, 29.

Habitat.—A moderate sized, deciduous tree, found in Central and South India, and Ceylon. Common in the forests of the Konkan, Deccan, and Coromandel, flower in March.

Gum.—"Satin wood gum was contributed by Dr Oleghorn to the Madras Exhibition of 1855. The specimen in the collection from Salem (1873) referred to this source is in tears, very variable in size, brittle, luent, brown, somewhat resemble

ble in water, tasteless or slightly mahogany colour, with an odour as in *Uru*. It was a peculiar and remarkable phenomenon which the mucilage of this sample exhibited, in that its surface was in an hour or two covered by a thick pellicle of gum, the upper surface of which became quite dry, as if, by rapid evaporation of the water in which it was dissolved, it was returned to the solid state. Although this pellicle was broken up, it continued daily to re-form on the surface of the solution.

"Another sample in the reference collection is from Ceylon, paler in colour and in definite, rounded, shining, amber-coloured tears" (*Cooke,*

103)

ribed sometimes by Hindu
the
to
8)
un-
ere
ht

DYE

1033

OIL

1034

MEDICINE

Bark

1035

Leaves

1036

TIMBER

1037

56lb per cubic foot

C. 1037

Garden Chrysanthemums.

CHRYSANTHEMUM.

It is durable and excellent for turning; used for agricultural implements, cart-building, furniture, and picture-frames. It is, however, very liable to decay. In Madras it is prized for the wheels of gun-carriage, and has been tried as a substitute for boxwood in engraving, but has not been found suitable. It is imported into England for cabinet-work and the backs of brushes.

SATIN-WOOD.

as it merits. The market is at present glutted with an over-supply, and the brokers, who were selling wood twelve to fifteen months ago at £20 a ton, cannot now get £6. In Ceylon, satin wood is used for building, furniture, and for the wheels of gun-carriage. It is sold in kotties of 8 to 10 cwt. for the district.

kotties part of the satin-wood cut is exported to Madras, where it is used for furniture and general building purposes" (*Indian Forester*, X., 1. 38).

Chocolate nut and bean, see *Theobroma Cacao*, Linn, STERCULIACEÆ

CHONEMORPHA, Don; Gen. Pl., II, 720.

Chonemorpha macrophylla, G. Don; Fl Br. Ind., III, 661, [Wight, Ic., t. 432; APOCYNACEÆ.

1038

Syn.—*Echites macrophylla*, Roxb, Fl Ind, Ed C B C, 245.

Vern.—*Garbadero*, Hind, *Yokchounrik*, LEPCHA, *Hark*, SYLHET.

References.—*Brandis*, For Fl, 323; *Kurz*, For Fl Burm., II, 187, *Gamble*, Man. Timb., 251, *Dals & Gibs*, Bomb. Fl., 145, *Voigt*, Hort Sub Cal., 523, *Balfour*, Cyclop.

Habitat.—A large climber with milky sap, met with in North and East

labarica) "the leaves of
bunches, and the roots
seed." The *Flora of*

GUM
1039
MEDICINE.
1040

British India alludes to that plant as a doubtful species

Chowli, or Chauli, see *Vigna Catiang*, Endl, LEGUMINOSÆ.

CHROMIUM AND CHROMITE.

1041

The metal Chromium occurs to a limited extent in India in the form of chrome ochre (chromite) in Salem in Madras and Spiti and Kashmir in the Himalayas.

such as

in the

is the

information see *Ball's Econ Geology*, 332, *Mallet*, *Mineralogy*, 53, *Balfour's Cycl.*, 717.

CHRYSANTHEMUM, Linn; Gen. Pl., II, 424.

1042

There are three wild species belonging to this genus met with in Western Tibet and one in upper Sikkim—all alpine in their character, never occurring below 9,000 feet. The *Chrysanthemums* of Indian pharmacy are the two garden species

C 1042

CHRYSANTHEMUM
indicum.

The Common Garden Chrysanthemum.

1043

Chrysanthemum coronarium, Linn ; Fl Br Ind, III, 314; Bot
CHRYSANTEMUM [Mag, t. 1521; COMPOSITE.Syn —C. ROXBURGHII, Desf ; PYRETHRUM INDICUM, Roxb, Fl. Ind,
t. 3, C B C, 601; MATRICARIA OLIFACEA, Ham in Wall, Cat, 3229Vern —Gul-chini, HIND. DEC ; Akur kurra, gul dandi, HIND ; Gul-
dandi, URDU ; Fukka garkah, AR. ; Zamil, Lagaur, PB ; Katsang,
LADAK ; Scott, BOM. ; Turisphat, gule-sera'li, MAR ; Gul dandi, GUJ ;
Shamanti ph, TAM ; Chamanti, TEL ; Hale, KAN ; Shéantiki, chan-
dra-mallika, sewati, swenti, SANS ; Gule-dandi, PERS ; Lawila-gas,
SINO Gul-chini is also applied to Plamiera acutifolia, Poiret, ARO-
CYNACEÆ.References —Dale, & Gibb, Bomb Fl. Supp., 45; Aitchison, Cat PB
Fl, 77; Pharm Ind, 127; Moodeen Sheriff, Supp Pharm Ind, 97,
Dymock, Mat Med W Ind, 371; Murray, Pl and Drugs, Sind, 183,
S Arjun, Bomb Drugs, 79; Drury, U Pl, 133; Balfour, CyclopHabitat.—A native of the Mediterranean region, only known in India
under cultivation as an ornamental garden plant. There are several very
distinct varieties, some large, others small flowered, and white, yellow, or
orange coloured. The foliage also varies considerably, some forms having
large and coarse, others small leaves. Two of the coarser forms seem
almost naturalised in India, and to such an extent that Roxburgh viewed
them as "natives of Bengal."MEDICINE.
Flowers.

1044

Root.

1045

Medicine.—"The FLOWERS are stated by Dalzell and Gibson to form
a tolerable substitute for Chimonile for medicinal purposes. The ROOT,
chewed, communicates the same tingling sensation to the tongue as pel-
litory, and might doubtless be used as a substitute for it. The people of
the Decern administer the plant, in conjunction with black pepper, in
gonorrhœa (Dr Walker, Bombay Med. Phys Trans, 1840, p 71)"
(Pharm Ind)"Akur kurra is a drug commonly used for toothache, and assigned by
Jameson to Spilanthes oleracea." (In Flora of British India, S. Acmeila,
Linn, var. oleracea, Clarke, Roxb, Fl Ind, III, 410) "It is probably
derived from different plants in different places. It is prescribed largely in
infusion, in conjunction with the lesser galangal and ginger, by native prac-
titioners, and by itself in European practice, for colic, hysterical affections,
pain in the head, and lethargic complaints, also in typhus fever. In
paralysis of the tongue it has been used as a local application with advan-
tage, also in apoplexy, chronic ophthalmia, and rheumatic affections of the
face. By the Persians it is considered discutient and attenuant, and
according to Celsus it was an ingredient in the famous cataplasm which,
in his time, was employed as a resolvent and for maturing pus, also as
an agent for opening the mouths of wounds" (Murray, Plants and Drugs
of Sind)

Garlands.

1046

Sacred Uses.—"The beautiful yellow fragrant flowers of this plant
are made into garlands and offered at the shrines of Vishnu and Siva"
(Balfour)

1047

C indicum, Linn, Fl Br Ind, III, 314; Bot Mag, t 327, 2042,
THE COMMON GARDEN CHRYSANTEMUM OF INDIA. [2556Syn —PYRETHRUM INDICUM, DC Prodr, VI, 62, CHRYSANTEMUM
INDICUM Willd in Roxb, Fl Ind, Ed, C B C, 604Vern —Gul dandi, HIND, a name applied, according to Roxburgh, to all
the varieties, Genda, bégaur (genda is the Hindustani for Tagetes erecta),
PB, Katsang, LADAK, Chewati, akurkurra, BOMB, Shevati, MAR.;
Akara carum, TAM, Chamanti, TEL

C. 1047

Chrysanthemum Fodder Grasses

CHRYSOPOGON
aciculatus

References — *Roxb, Fl Ind, Ed C B C, 604*; *Clarke, Compositae Ind, 146*; *Dals & Gibs, Bomb Fl Supp, 48*; *Stewart, Pb Pl, 124*; *S Arjun, Bomb Drugs, 192*; *Baden Powell, Pb Pr, 358*; *Birdwood Bomb Prod, 50*

Habitat — Commonly cultivated in Indian gardens, and is in fact only

MEDICINE.
Flowers
IO48

natives heating and aperient, and useful in affections of the brain and calculus, and also to remove depression of spirits Drury says the "natives of the Deccan administer the plant, in conjunction with black pepper, in gonorrhœa"

Sacred Uses — The flower heads are sacred to Vishnu and Siva

Garlands
IO49

CHRYSOPHYLLUM, Linn, Gen Pl, II, 653

Chrysophyllum Roxburghii, G Don, Fl Br Ind, III, 535;
Bedd, Fl Sylv, t 236, MELIACEÆ

IO50

THE STAR APPLE

Thwaites, En Ceylon Pl, 174; *Dals & Gibs, Bomb Fl 138*; *Voigt, Horti Sub Cal, 340*; *Lisboa, U Pl Bomb, 68*; *Balfour, Cyclop*

Habitat — An evergreen tree of Bengal, Burma, the Western Ghâts, and Ceylon

Food — Fruit edible Roxburgh says "The fruit ripens in October, and is greedily eaten by the natives, though to me the taste is by no means agreeable the pulp being almost insipid, and, though tolerably firm,

FOOD
Fruit
IO51

TIMBER
IO52

CHRYSOPOGON, Trin Gen Pl, III, 1135

Chrysopogon aciculatus, Trin, Dulhit, Fodder Grass, 39, GRAMINEÆ

IO53

Syn — ANDROPOGON ACICULATUS Linn (P Retz); *Roxb, Fl Ind, Ed C B C 88* A ACICULARIS Kunth

Vern — *Sarwala lampa*, HIND; *Chor-kantâ*, BENG; *Kate chettu, kalle gaddi* TEL; *Audira gulla*, MALA; *Shunkhini, chorapushpi, keshini*, SANS; *Tulliri SING*, CHUNG MYI BURM

References — *Thwaites, En Ceylon Pl, 375*; *Trimen, System Cat, 108*; *Dals & Gibs, Bomb Fl, 303* U C Dul, Mat Med Hind, 295, *Balfour, Cyclop*, Wall in Report Calcutta Intern Exhbn

Habitat. — A small, coarse grass, growing on barren, moist pasture ground throughout Bengal, also in the North-West Provinces, Central Provinces, and in the warmer parts of Ceylon Along with *Cyperus rotundus* and *Imperata arundinacea* this constitutes the characteristic turf of Bengal

Fodder — Cattle do not seem to like it. Its thin, straight culms, 1 to 2 feet high, flower, and the small sphelets of awned barbed, fruits which follow, are troublesome to those who walk through the grass, as they stick

FODDER.
IO54

CICER
arietinum.

Fodder Grasses: The Common Gram

1055

to the stockings and produce until removed a pricking and itching sensation. As soon as the spikelets appear cattle refuse to eat the grass.

Chrysopogon cœruleus, Nees; *Duthie, Fodder Grasses*, p. 39

Syn.—*RHAPHIS CÆRULEA*, Nees

Vern.—*Dhanlian*, Pa.; *Ahar*, SALT RANGE; *Dhauia*, SIWALIK RANGE, GHATEA, KUMAON; *Tigni*, BUNDELKHAND; *Palla poggar gadi*, CHINDA; *Thingra ka jhara*, AHILL, BERRAR

Habitat.—A common grass on the hilly tracts of Northern India, usually on stony or sandy soils

Fodder.—On the Siwalik range it is extensively used as fodder

FODDER.

1056

C. gryllus, Trin.; *Duthie, Fodder Grasses*, 40

Syn.—*C. ROYLEANUM*, Nees; *ANDROPOGON GRILLUS*, Linn

Reference.—*Aitchison, Cat Pb Pl*, 175

Habitat.—The plains and hills of the Punjab and N.-W. Provinces

Fodder.—Mueller says it is a useful fodder grass in Australia

FODDER.

1058

C. montanus, Trin., *Duthie, Fodder Grasses*, p. 40.

Syn.—*C. PARVIFLORUS*, Benth.; *ANDROPOGON MONTANUS*, Roxb

Vern.—*Dallak Raj*

Habitat.—The hilly parts of Northern India (Mount Abu)

Fodder.—In Rajputana it is said to be viewed as excellent fodder, and the grain is also sometimes collected and eaten by the natives

FODDER.

1060

Cicca disticha, Linn., see *Phyllanthus distichus*, EUPHORBACEÆ

Cicendia hyssopifolia, W & A., see *Encostema littorale*, Blume, [GENTIANACEÆ]

1061

CICER, Linn., *Gen Pl*, I, 524

Cicer arietinum, Linn., *Fl Br Ind*, II, 176, Wright, Ic, t. 20

[LEGUMINOSÆ]

THE COMMON GRAM OR CHICK PEAS, CECE, It., *Garbanzos*, Sp

Vern.—*Chold bñi*, but *kalai*, BENG.; *Chana*, *chunna* HIND.; *But*, SANTALI; *Channa chola*, PB.; *Chold chand* RAJPUTANA; *Chana*, *harbara* DOND; *Chenna*, DUK.; *Kadli* KARNATICK; *Chahna*, *chano*, SIND; *Chania*, *chana* GUJ.; *Harbara*, MAR.; *Kadali*, TAM.; *Sannar-gali*, *harinandhakam*, TEL.; *Kudoly kempu kadale*, *kari kadale*, KAN.; *Humer*, ARAB.; *Nakhud*, PERS.; *Chanaka*, *chennuko*, SIKHS.

aga pulusu, *shanagakadi*

Stewart, 10 11 63
t. Pl 323, 101st Hort
off Supp Pharm Ind
Nat Med W Ind, 2nd
gs and Pl, Sind 120,
Powell Pb Prod, 241,
ood, Bomb Prod 293
lter, Field and Garden
urv of Bolany New

Lec
Off

Habitat

especially in the northern provinces

This is the *Cicer* of the Romans, and the parched seed, as an article of food with the poor, is alluded to by Horace (*Cicer frictum*). It is also

C. 1061

or Chick Pea.

CICER
arietinum.

the *σπ-εβινθος* of Dioscorides. The botanical specific name owes its origin to a not altogether fanciful resemblance of the seed, when first forming in the pod, to a ram's head (the *κρίος* of the Greeks). The English name "gram" is applied to a totally different product in the Madras Presidency, where it denotes the seed of the plant known in the other provinces as *kurti* (*Dolichos biflorus*). In Madras it is *Phaseolus Mungo* or "Bengal gram," where the word "gram" is exclusively given to the pea of *Cicer*.

History.—The chick-pea was thus known to the Greeks in Homer's time under the name *Erebinthos*, and to the Romans as *Cicer*, and the existence of other widely different names shows that it was early known and perhaps indigenous to the south-east of Europe. It is supposed that the chick-pea has been cultivated in Egypt from the very earliest times of the Christian era, and was perhaps considered common or unclean, like the bean and the lentil. But it is most likely that the pea was introduced into Egypt as well as amongst the Jews from Greece or Italy. Its introduction into India is of more early date, for there is a Sanskrit name and several other names in modern Indian languages. "The Western

HISTORY.

from Persia to Greece, and the species now exists only in cultivated ground, where we do not know whether it springs from a stock originally wild or from cultivated plants." (*DC., Orig. Cult. Pl.*)

CULTIVATION.

N.-W. Provinces.—The varieties grown in the North-Western Provinces are the former of a black and the latter of a small size. Gram is grown in the area under cultivation in the temporarily-settled districts is estimated at about 42½ lakhs of acres. It is sown from the middle of September to the middle of October at the rate of 80 to 100 lb to the acre, generally in a soil which lay fallow during the preceding kharif; the crop is gathered in March, April, and May. The soil for gram varies from the heaviest clay to the lightest loam, but it is found to prefer the former. It does not require so fine tillage as wheat and barley do, nor much

CULTIVA-
TION.

N.-W. P.
Large 1062
Small 1063
Cabul. 1064

follows:—

	R a. f.
Ploughing (four times)	3 0 0
Seed (50 lb)	2 0 0
Sowing	0 14 0
Reaping	1 9 0
Threshing	2 0 0
Cleaning	0 6 0
TOTAL	9 13 0
Rent	3 0 0
GRAND TOTAL	12 13 0

or Chick Pea.

CICER
arietinum.

Of Poona it is stated that the *chana* or *harbhara* (gram) is the most largely grown of all the pulses, but chiefly in the east of the district. It requires good black soil and is sown in November without either water or manure and is harvested in February. The leaves are said to be used

CULTIVA-
TION.

Holsa.

1068

Dal

1069

Puran-poll

1070

Phutanas.

1071

March It is stated to be admirably suited for cultivation on new lands

paratory crop for *Sorghum vulgare* and cotton. "It certainly checks weeds. But it as certainly benefits the land in other ways also, which are not yet satisfactorily known. The average acre outturn is 650lb" (*Bomb. Gas.*, XXIV., p. 169). "As it takes very little out of the soil and checks weeds, gram is grown more to clear the ground than for profit, the returns seldom more than covering the cost of tillage" (*Bomb. Gas.*, XII., p. 151).

In the Panjab, as, indeed, in all wheat producing provinces, gram is

PANJAB

1072

causes the plant to spro

In Marwat it is rotated with the practice, that gram leaves

frequently it is scattered broadcast after one imperfect ploughing of the soil. Rain in March to April causes the pods to be attacked by cater-

iven, but, as

least after a

ie stalks and

than poison

j, black, and

white, the last is, however, rare. It is known as *Cabuli chhola*. It is softer, parches better, and yields a better *dāl* than the others. Confectioners use it as it does not require to be peeled before use. Gram is injured by lightning and rain. Of the Karnal District it is stated that the

Red

1073

Black

1074

White.

1075

Cabuli

1076

C. 1076

CICER
arietinum

The Common Gram

CULTIVA-
TION.

Phaill
1077
Amin
1078
Improves
soil

RAJPUTANA

1079
CENTRAL
INDIA
1080
BENGAL
Straw-colour-
ed
1081
Kabuli
1082

BURMA
1083

gram grows best on the stiff soils but is exceedingly sensitive to frost. A green worm called *sund* attacks the seed, especially if the Christmas rains are late. In Hoshiarpur it is believed a line of linseed around the gram field is supposed to protect the crop from the injurious effects of lightning. In Gurgon the people also believe lightning is injurious to the gram crop when in flower, in Gujranwala hares are very destructive to the gram crop. Of Dera Ismail Khan it is said gram fails altogether one year out of every three. In Muzaffargarh the young leaves are eaten as a vegetable, being known as *phaill*. The pods are roasted and eaten under the name of *amin* and *dhadhl*. *Amin*, plural *amin*, is used in the north, *dhadhl* in the south. The word *amin* is said to take its origin from an expression in allusion to gram ripening first of the *rab* crops. The effect of gram in improving the soil is known in Multan. "The crop is not only profitable, but it is also said to act as a manure and improve the land for the next *kharrif* crop."

In Rajputana and Central India, gram is also grown, and especially along with wheat. There is nothing, however, of a special nature to record.

Bengal.—Gram, except in the wheat producing districts, is not very extensively cultivated. The Director of Agriculture reports that "There are two varieties grown, *vis*, the straw coloured and the white, or *Kabuli*. Gram requires a heavy soil, does best in the clay or wheat soil, can be grown in loam, but not in a sandy soil, comes after the *kele paddy*, a connecting link between the *aus* paddy and the *amin*. Five or six ploughings suffice to prepare the land, fine pulverisation of the soil not being required."

"Gram may be sown alone or mixed with wheat, in the first case seven seers and in the other five seers, to the *bigha*." The sowing time extends from the second week in October to the first week in November. "No after cultivation is required." Harvest time is, February to March. "Threshing is effected by beating with a stick or treading under bullocks' feet. At the first beating or treading only the pods come out, the second and the third beating or treading gives the seed. The outturn is from 2½."

In Burma—Mason says gram is grown extensively by the Burmese. GRAM AS A ROTATION WITH WHEAT.—In a recent lecture, on Indian agriculture, delivered before the agricultural students of the Edinburgh University, Professor Wallace, while stating his opinion that wheat cultivation could not be greatly extended in this country, alluded to the beneficial effects of leguminous crops cultivated in rotation with wheat. It has already been shown in the remarks under gram cultivation in the Bombay Presidency, that this fact is fully recognised by the Indian cultivator. The Professor anticipates a ruinous reduction of pulse cultivation in India, but admits that although the scientific principle of a rotation of crops is not thoroughly understood by the Indian cultivator, the habit of cultivating pulses, and particularly gram, as a mixed crop with wheat, or in rotation with wheat, in a measure meets this necessity. It should be borne in mind, however, that seasonal peculiarities force on the Indian farmer a rotation. He has at least two if not three crops every year—the *rab* and *kharrif*, the former reaped in spring and the latter in autumn. The majority of the pulses belong to the latter crop and are thus cultivated in the season when wheat cannot be grown, and are on that account not likely to be seriously displaced by an extended wheat cultivation. Gram is in fact the only leguminous crop that might suffer in this direction, and hence it seems desirable that as little as possible should be urged against the practice of growing that pulse as a mixed crop with wheat or barley. from

or Chick Pea.

CICER
arietinum."LITVA-
ION.recom-
mended as an
article for
European
Cattle

the Society of Arts the writer took occasion to recommend the extended importation of gram into England as an article of diet for horses. Throughout India it may safely be said gram is the staple article of horse food. In Madras another pulse takes the place of gram, but horse diet in this country has always a much larger percentage of pulses in it than in Europe. The animals thrive admirably on such a diet, and the opinion may be advanced that where muscular strength is required a diet that contains a distinct and rational proportion of nitrogenous matter is a more wholesome one than the over-starch diet given in Europe. The writer stated in the paper alluded to "Chemical and horse diet which consists exclu- nor so likely ture of some cent, and of to 70 7 per ce the muscle-f which would nutritious ar of oats and Indian corn to obtain the indispensibly necessary amount of albuminoids from an English diet, the animal has to eat a greatly

less than two diseases
be called Principal
which I believe to be
a nerve disease, de-

exists on the subject of cattle and cattle diseases in India, and in no instance is there the slightest allusion to gram as the cause of any disease. Indeed, anthrax would appear to occur far more frequently among cattle not fed on gram than among those that get a regular amount of that pulse in their diet. In the small Native State of Manipur, where gram is not grown, as food for cattle, anthrax or a closely allied disease, is a very common cause of death among the rice fed ponies. The disease alluded to is in India attributed to a sudden and large supply of fresh grass after periods of scarcity—an annual occurrence due to the periodicity of the rains following a hot season when all grass is burned up. May it not be that the pulse viewed as "gram" by the above mentioned authorities was not gram at all but the injurious seed of *Lathyrus sativus*, the properties of which, in causing paralysis, are well known?

CICER
arietinum.

The Common Gram

CHEMISTRY.
1084

These remarks regarding anthrax have, however, been made in this place mainly to prevent undue alarm, until Professor Wallace's suggestions regarding a possible connection between it and gram-feeding have been proved correct.

CHEMICAL PROPERTIES OF GRAM.

Professor Church, in his *Food-Grains of India*, gives an interesting account of this pulse, but is in error in too prominently restricting the name *gram* to the forms of *Phaseolus Mungo*. This is the case only in the Madras Presidency; throughout the rest of India the terms black and green gram are practically unknown, the word gram signifying the pulse *Cicer arietinum*, although the term horse-gram is sometimes applied to the pea of *Dolichos biflorus*. In Madras it might fairly well bear that name, since it takes the place of *Cicer arietinum* as a food for horses. The Professor gives a valuable table as the result "of nine analyses of the unhusked peas and of four analyses of the peas from which the husk has been removed."

"COMPOSITION OF THE CHICK-PEA.
IN 100 PARTS.

	Husked.	With Husk	In 1 lb Husked.
			Oz. Grs.
Water	11.5	11.2	1 367
Albuminoids	21.7	19.5	3 207
Starch	59.0	53.8	9 192
Oil	4.2	4.6	0 294
Fibre	1.0	7.8	0 70
Ash	2.6*	3.1†	0 182

* 1.1 of Phosphoric Acid.
† 0.8 of Phosphoric Acid.

"The nutrient ratio in the unhusked peas is 1 : 3.3; the nutrient value is 84."

The unhusked peas are therefore more nutritious than the husked, and it may be concluded that the process of steeping them in water before being mixed with the oats or other cereal both softens the pea and removes entirely the dust and mud associated with the pulse. This is an important consideration for the food of horses and having

a high reputation.

TRADE AND PRICES.

Very little can be learned regarding the internal trade in gram. It is extensively eaten by the natives in every part of the country, and there is therefore great and considerable internal trade in the pulse. The principal markets are Calcutta, Bombay, Karachi, or Calcutta, Lahore, among the Punjab and the Bombay Presidency. In Madras it is of less consideration.

TRADE.
1085

or Chick Pea.

CICER
arietinum.

The foreign trade is at present not very extensive. The following were the exports during the past five years:—

TRADE.

	Cwt.	R
1882-83	312,953	8,29,647
1883-84	322,724	11,09,796
1884-85	314,965	9,28,843
1885-86	334,129	10,74,771
1886-87	306,979	9,84,046

The exports in 1870 were only 23,171 cwt., valued at Rs. 94,900; but it

other.

Prices.—In a recent number of the publication issued by the Department of Finance and Commerce under the title of *Prices and Wages in India*, Mr. O'Connor has published tables which afford perhaps the most trustworthy data for arriving at a knowledge of the price of gram, his figures represent seers (2lb) to the rupee. Mr. O'Connor's results of average prices may be thus summarised:—

PRICES.
1086

	I 1873 to '76	II 1877 to '80	III 1881 to '84	IV 1873 to '80.
Madras	23 63	17 77	32 05	20 7
Bombay and Sind	17 06	11 47	18 45	14 27
Bengal	20 58	15 31	21 77	17 94
North-Western Provinces and Oudh	26 61	18 36	24 53	22 48
Panjab	30 04	18 29	26 7	24 16
Central Provinces	31 02	18 1	27 25	24 56

It is to be noted that the above figures are for the price of gram, and includes (as perhaps do the above figures) pulses that have a lower value than the true gram.

be landed at a price con-
d for horses' food. Refer-

placed bef
some resp

he price of gram varied con-
son of the year. It would be
all these prices, but the follow-
quotations, the prices being

C P.
1087

C. 1087

CICER
aetinum.

The Common Gram

PRICES.

seers to the rupee, in which of course a larger quantity for the sum mentioned would mean cheapness and a less quantity dearthness:—

DISTRICTS.	August 15th.	November 15th.	February 15th.	May 15th.
Mandla	45'	42'	40'	40'
Damoh	39'	27'	29'8	40'
Sambalpur	15'	19 8	19 8	.
Wardha	20	22'	21'	24'

The difference between the prices at which the cultivators sell the produce of their fields to the dealers, at harvest time and at other periods throughout the year, is not as a rule very great, still the prices are a little more favourable after harvest. Gram being a *rabi* crop it is harvested from February and March to April, and a mean of the quotations for the Central Provinces gives the average price in May as 26 8 seers to the rupee or 53'8 for, say, 1s. 5d. at present rate of exchange.

Bengal is not a large gram-growing province, and it is accordingly dearer there than in most other parts of India. The Director of Agriculture, in his report for 1886, gives the price of gram at 24 seers to the rupee after harvest and 20 seers at other seasons. Taking a high exchange, these quantities would represent 48 to 40lb for 1s. 5d.

Bombay.—The quotation has been given in one of the *Crop Experiments* of 60 seers to the rupee, or, at the rate of exchange adopted in the preceding estimates, 120lb for 1s. 5d. It is probable, however, that this figure is much too low, and that the average price in the Western Presidency bears a closer approximation to that given for the Central Provinces and Bengal.

Panjab.—In the Lahore district, according to the *Gazetteer*, gram is stated to be sold at 100lb to the rupee (= 1s 5d.). In the Multan district, the average price for the past 20 years is given as 60lb and in the Jhelam district for the past 44 years as from 68 to 110lb according to the various parts of the district.

In the North-West Provinces gram is variously quoted in the *Gazetteers*; thus, in Bulandshahr 26 seers; in Meerut since 1850 to the present date it has ranged from 55 seers to 20, and in 1869 fell to 9½ seers; in Muzaffarnagar since 1821 the price has varied from 70 seers the highest to 14 the lowest; in Budaun it is given as 30'8 seers; in Bijnor about the same; in Bareilly it is much more expensive, and in Gorakhpur gram is considerably dearer than wheat.

Dye.—The leaves are said to give indigo. This curious fact is known to the Chinese. The dye is allied to the Assam so-called green, obtained from *Vigna Catjang*, which see.

Medicine.—In medicine the SEEDS are considered antibilious. The chief interest medicinally is, however, in the ACID LIQUOR obtained by collecting the dew-drops from the leaves. The fact that the drops of dew are thus chemically changed through contact with a living plant is a point of great botanical interest not at present fully understood. The liquid is found chemically to contain oxalic, acetic, and malic acids. This vinegar is mentioned by the old Sanskrit writers as a useful astringent, which might with advantage be given in dyspepsia, indigestion, and costiveness.

One of the earliest European writers who describes "Cicer Vinegar" was the Po'shep'orer Dr Hove, who spent the greater part of 20 years in the Bombay Presidency in 1737-53. His report was some 20 years

C. 1094

BENGAL.
1088BOMBAY.
1089PANJAB.
1090N. W. P.
1091DYE.
1092MEDICINE.
Seeds
1093Gram
Vinegar
1094

or Chick Pea.

CICER
arietinum.

MEDICINE.

afterwards published in the Records of the Bombay Government (xvi. 1855): at page 57 he says:—"On the road to Dowlai" (a village about

it becomes an acid, which they use instead of vinegar, and that it makes a pleasant beverage in the hot season, when mixed with water; as likewise they used it as an antidote for the venom of pernicious snakes, of which there is a great number in the wet season. I tasted the dew but found it of no particular taste, except rather softer than common water, as it is peculiar to the dew." Further on at p. 63, he observes that the natives

a few days ago, which had likewise already acquired a mineral acid, but not quite so powerful."

Sir George Birdwood gives in his Catalogue of the Bombay years ago, my *munshi* asked me

Dr. Moodeen Sheriff gives an interesting account of the collection of this liquid. "A piece of clean cloth is tied to the end of a stick and the pulse crop is brushed with this in the early morning, so as to absorb the dew. This is then wrung out and preserved." "The genuine drug can only be obtained from persons who own fields of gram; what is sold by native druggists is dilute sulphuric acid slightly tinged with some colouring matter." It is useful in diarrhoea and dysentery, and is given as a drink with water in sunstroke. The boiled leaves are applied as a poultice to sprains and dislocated limbs. The fresh juice of the leaves mixed with crude carbonate of potash is administered with success in dyspepsia (*S. Ayjun, Bomb. Drugs, 9, 193*). The acid liquid is employed as a refrigerant in fever. It is much used in the Deccan in the treatment of dysmenorrhoea; the fresh plant is put into hot water and the patient sits over the steam. Dr. Walker observes that this is another way of

blue; also, in cases of serves as a

Special Opinions—§ "The liquid obtained from macerated

the
ed
infl

Chana-amba (locally) "The sold in the bazars—is generally dilute sugar" (*Surgeon-Major W. Dymock*, tender leaves of *nm* in cases of leprosy.

Chana-amba.

The water in which it has been macerated is used as a remedy for bilious.

CICER
arietinum,

The Common Gram

PRICES

seers to the rupee, in which of course a larger quantity for the sum mentioned would mean cheapness and a less quantity dearth —

DISTRICTS	August 15th	November 15th	January 15th	May 15th
Mandla	45	42	40	40
Damoh	39	27	29 8	40
Sambalpur . . .	15	19 8	19 8	
Wardha	20	22	21	24

The difference between the prices at which the cultivators sell the produce of their fields to the dealers, at harvest time and at other periods is not as a rule very great, still the prices are a little lower when the crop is harvested from the Central Provinces to the rupee or

BENGAL
1088

Bengal is no dearer there than in most other parts. The Director of Agriculture, in his report for 1886, gives the price of gram at 24 seers to the rupee after harvest and 20 seers at other seasons. Taking a high exchange, these quantities would represent 48 to 40lb for 1s 5d.

BOMBAY
1089

Bombay — The quotation has been given in one of the *Crop Experiments* of 60 seers to the rupee, or, at the rate of exchange adopted in the preceding estimates, 120lb for 1s 5d. It is probable, however, that this figure is much too low, and that the average price in the Western Presidency bears a closer approximation to that given for the Central Provinces and Bengal.

PANJAB
1090

Panjab — In the Lahore district, according to the *Gazetteer*, gram is stated to be sold at 100lb to the rupee (= 1s 5d). In the Mooltan district, the average price for the past 20 years is given as 60lb and in the Jhelam district for the past 44 years as from 58 to 110lb according to the various parts of the district.

N W P
1091

In the North West Provinces gram is variously quoted in the *Gazetteers*, thus, in Bulandshahr 26 seers, in Meerut since 1850 to the present date it has ranged from 55 seers to 20, and in 1869 fell to 9½ seers, in Muzaffarnagar since 1821 the price has varied from 70 seers the highest to 14 the lowest, in Budaan it is given at 30 8 seers, in Bijnor about the same, in Bareilly it is much more expensive, and in Gorakhpur gram is considerably dearer than wheat.

DYE
1092

Dye — The leaves are said to give indigo. This curious fact is known to the Chinese. The dye is allied to the Assam so-called green, obtained from *Vigna Catjang*, which see.

MEDICINE
Seeds
1093

Medicine — In medicine the SEEDS are considered antibilious. The chief interest medically is, however, in the ACID LIQUID obtained by collecting the dew drops from the leaves. The fact that the drops of dew are thus chemically changed through contact with a living plant is a point of great botanical interest not at present fully understood. The liquid is found chemically to contain oxalic, acetic, and malic acids. This vinegar is mentioned by the old Sanskrit writers as a useful astringent, which might with advantage be given in dyspepsia, indigestion, and costiveness.

Gram
Vinegar
1094

One of the earliest European writers who describes "Cicer Vinegar" was the Polish explorer Dr Hove, who spent the greater part of two years in the Bombay Presidency in 1787-83. His report was some 70 years

C. 1094

or Chick Pea.

CICER
arietinum.

MEDICINE.

afterwards published in the Records of the Bombay Government (xvi. 1855): at page 57 he says:—"On the road to Dowlat" (a village about

there is a great nu
it of no particular

that against
had a parti-
had gathered
val acid, but

of gram; what is sold
hly tinged with some
colouring matter." It is useful in diarrhoea and dysentery, and is given
as a drink with water in sunstroke. The boiled leaves are applied as
a poultice to sprains and dislocated limbs. The fresh juice of the leaves
mixed with crude carbonate of potash is administered with success in
dyspepsia (*S. Arjun, Bomb. Drugs*, 9, 193). The acid liquid is employed
as a refrigerant in fever. It is much used in the Deccan in the treatment
of dysmenorrhoea; the fresh plant is put into hot water and the patient
sits over the steam. Dr. Walker observes that this is another way of
vegetable,
sons liable
the bladder,
bile; also,
in cases of
erves as a

Special Opinions.—§ "The

any unite Chana-amba.
Dymock,
s of leprosy.
for bilious-

CICER
soongaricum.

The Common Gram.

MEDICINE.
Chana-khar.

ness" (Brigade Surgeon F. H. Thornton, B.A., M.B., Manghir). "The vinegar, which is known here as *chana khar*, is used for enlarged spleen." (Surg. Major R. D. L. Aligarh). "In the treatment of al catarrh, the seeds, eaten give a cup of warm milk, (ar, Muskat, Arabia), which is absorbed by

"It is
have alterative properties" (Aligarh).

CHEMISTRY.
1095

Chemical Composition.—The seeds contain, according to Balfour, moisture 10.80 per cent., fatty matter 4.56 per cent., nitrogenous matter 19.32 per cent., mineral constituent (ash) 3.12 per cent., and starchy Dr. Warden, however, gives the following compo-

FOOD.
1096
Parched
Gram
1097
Ragout.
1098
Young plants.
1099
FODDER.
1100

classes of natives parched gram (*chabena*) is much eaten. Masson informs us that in the Panjab it is made into bread, which was a favourite article of food with the Sikh sirdars. The natives also eat it boiled in the form of ragout, seasoned with a little pepper or capsicum. The young plants are Madras and Gujarat, either raw seed is threshed fodder (Stewart; nach. Dr. Chris- he acid exudation used in their cut-

ries instead of vinegar.

The following account of gram given in the *Treasury of Botany* may be quoted here: "In India the seeds form one of the pulses known under the name of 'Gram,' and are greatly used as an article of food by the natives, being ground into meal, and either eaten in puddings or made into cakes. They are also toasted or parched, and in this state are commonly carried for food on long journeys. Rolled in sugar-candy, these toasted peas form a rough sort of comfits, and gram-flour made up with sesamum oil and sugar-candy is an Indian sweetmeat."

Cicer Lens, Willd., see *Ervum Lens*, Linn.

1101

C. soongaricum, Steph.; *Fl. Br. Ind.*, II., 176.

Vern.—*Tishá, jawáne, banyaris, sárrí, serri*, Ps.

References.—Stewart, *Pb. Pl.*, 63; Murray, *Drugs and Pl. Sind.*, 120; Church, *Food-grains of India*, p. 131.

FOOD.
Seeds.
1102Shoots.
1103

Agri.-Horticultural Society many years ago (having been first found in the Himálaya by Captain Munro as grain is eaten by the people. The by the Chinese, and a vinegar are often covered by a viscid exudation, with a strong aromatic odour.

C. 1103

The Wild or Indian Endive.

CICHORIUM
Intybus.

Atchison states that in Lahul shoots are used as a pot-herb, and that the
pears are eaten there, as they are, both raw and cooked, in parts of Ladak
(Stewart, Pb Pl, 63. Henderson, Mission to Larkind)

CICHORIUM, Linn.; *Gen. Pl*, II, 506.

Cichorium Endivia, Linn., *Fl Br. Ind*, III, 391; **COMPOSITÆ**

THE GARDEN ENDIVE

Vern.—*Asini*, HIND, *Bomb*, *Beva*; *Kashini virai*, TAN

References—Aurs, *For Fl Burm*, 78 Atchison, Pb Pl, 81; DC,
Origin of Cult Pl, 57. Dymock, *Nat Med W Ind*, 2nd Ed; Lisboa,
Treasury of Botany

red to be a native of
Be this is it may, there
lent food from a very
early period by the Egyptians, through whom the Greeks and Romans

1104

11. 1104)

Medicine.—“Endive is much valued by the *hakims* as a resolvent and
cooling medicine, and is prescribed in bilious complaints such as taraxa-
cum is with us. These are one of the four lesser cold seeds of old
East” (Dymock). The root is
rifuge, given in ‘*munjus*,’ the
the seed is used in sherbets”

MEDICINE.
Seeds.

1105

Root

1106

forming part of a garden salad, and Pliny states that endive in his time
it has been used in
fact that the manner
by Gerarde in 1597,

FOOO.

1107

11. 1107) (Treasury of Botany)

C Intybus, Linn.; *Fl Br Ind*, III, 391, **COMPOSITÆ**

THE WILD OR INDIAN ENDIVE, CHICORY, OR SUCCORY

Vern.—*Kasni* HIND, *PERS*, *Hindyba* ARAB, *Kashini-virai*, TAN,
Kasini-vittulu, TEL, *Hand gal*, *suckal kasni*, Pb *Kasani* GUJ

References—Brandis, *For Fl 77 Kurns*, *For Fl Burm 77 Stewart*,
Pb Pl, 124 Atchison Pb Pl, 81 DC, Origin of Cult Pl 65

1108

Habitat—North-West India, Kumaon, distributed westward to the
Atlantic

§ “In the plains of the Panjab it is cultivated by natives as a pot-herb
(*sag*), and may be an escape, truly wild at 4000 to 11,000 feet” (*Sur-
geon-Major J E T Atchison, Simla*)

C. 1108

CICHORIUM
Intybus.

The Wild or Indian Endive.

HISTORY.

History.—"The wild perennial chicory, which is cultivated as a salad, as a vegetable, as fodder, and for its roots, which are used to mix with coffee, grows throughout Europe, except in Lapland, in Morocco and Algeria, from Eastern Europe to Afghánistán and Beluchistán, in the Panjáb and Kashmír, and from Russia to Lake Baikal in Siberia. The

CULTIVA-
TION.
1109

that has been dug or acre. This is the way of France and in Lomb fodder or herbage crop, is as follows: Prepare the soil, by thorough

during March, 4lb per acre, at about nine inches apart, and

set out in rows nine inches apart, and at six-inch intervals in the rows. In either case, the land must be kept clean, and well plant in the rows. In the first season, ordinary attention will afterwards and profitable for five years at

symptoms of failure, the course of cropping pursue sown or planted with chicory.

"In preparing the land for a root crop, deep ploughing is recommended; indeed, it will a time in coming up, generally five or six weeks from the time of sowing the seed, it is necessary that the land should be very clean, or the weeds (partic-erent districts, in the midland and week in May is considered best, for the root), many of the plants will run 'runners,' or 'trumpeters,' and must

be care-ived, they will spoil the soil, if the seed has been sown broadcast, but the preference is usually given to drilling, the crop being easily hoed and cleaned. The rows are generally from nine to twelve inches apart, and about 3 or 4lb of seed per acre is the quantity used. Most of the cultivators of chicory single out the plants so as to leave spaces between them in the rows, each about six or eight inches long; but there are many who do not do this, fancying that four or five small plants produce more weight of root than one large plant. The expediency of this, however, is very questionable, as it does not allow of the land being nearly so well cleaned as when the practice of singling is adopted" (*Merten, Cyclop of Agri*, I, 457).

C. 1109

Chicory and Coffee

CICHORIUM
Intybus.

In India—Very little of it is grown in the country.

CULTIVATION.

alternative. It seems probable that the plant is also grown as a fodder in some parts of the Panjáb plains, but although a large trade might easily

a drug and
of seed as

Great Britain imports annually close upon 200,000 cwts of the root. It is imported from

properties. The seeds
on of the seed is used
not is bitter and used

MEDICINE.
IIIO

and sulphate of potash, mucilage, and some bitter extractive principle. An infusion of chicory mixed with syrup causes a thickening of the liquid (Balfour)

Special Opinions—“Used as a substitute for taraxacum” (Assistant Surgeon Nehal Singh, Calcutta). “The liver in cases of infusion of p A strong us vomit- ing” (Surge used by nat “Much Surgeon Bhugwan Dass, Rawal Pindi).

Food.—“The young plant is recommended

FOOD.
IIII

(Ro
du
roa

use of the root of chicory, as was the case in France during the suspension of the tea trade.

with coffee
nouncing
coffee mix
mixture.
properties
on the oth
dandelion,
(Treasury
ture of ch

Chicory In
Coffee.

e of those
ge, while,
those of
tant use”

by many persons been viewed as a grocer is ordered to sell the grocer requires to do is to sell

“pure coffee” when he advertises such. His special “coffee mixture” may be anything he pleases to make it. The sale of chicory, separate from coffee, has been strongly recommended by Sir James Elphinstone. “The root tastes at first sweetish and mucilaginous, and then very bitter; the bitterness is greater in summer than in spring. For over a hundred years chicory has been used as a substitute for, and admixture with, coffee. In preparing chicory, the roots are washed, cut into small pieces and kiln-dried, and then roasted and ground. Roasted chicory

C. IIII

CIMICIFUGA
fœtida

Chicory and Coffee: Black Snake Root.

FOOD.

contains a volatile empyreumatic oil, to which its aroma is due, and a bitter principle. It contains no caffeine. Infused in boiling water it yields a drink allied in flavour and colour to coffee. It is largely used in Belgium. In some parts of Germany, the women are said to be regular chicory toppers (Parry)." (Surgeon C. F. H. Warden, Prof. of Chemistry, Medical College, Calcutta)

The following extract, relating to the fact of the chicory roots being a new source of alcohol, was published in the *Tropical Agriculturist* of 1st December 1882, page 495. also p 57 —

"According to *Erfindungen und Erfahrungen*, the celebrated coffee substitute, chicory, seems likely to become of importance as a source of alcohol. The root contains an average of 24 per cent of substances easily convertible into sugar, and the alcohol obtained by its saccharification, fermentation, and distillation, is characterised by a pleasant aromatic taste and great purity" (*Chemist and Druggist*).

ADULTERA-
TIONS.
III2

Adulterations — "Roasted chicory is extensively adulterated. To colour it, Venetian red and, perhaps, redde are used. The former is sometimes mixed with the lard before this is introduced into the roasting machine; at other times it is added to the chicory during the process of grinding. Roasted pulse (peas, beans, and lupines), corn (rye and damaged wheat), roots (parsnips, carrots, and mangold wurzel), bark (oak-bark tan), wood-dust (logwood and mahogany dust), seeds (acorns and horse-chestnuts), the marc of coffee, coffee husks (called coffee-flights), burnt sugar, baked bread, dog-biscuit and baked livers of horses and bullocks (i), are substances which are said to have been used for adulterating chicory. A mixture of roasted pulse (peas usually) and Venetian red has been used under the name of *Hambro' powder* for the same purpose" (*Ure's Diet, Art and Manuf*). A recent examination of certain "coffee mixtures" revealed the fact that roasted cockroaches and iron rust were employed as adulterants. (*See Coffea arabica*, para. Adulterants)

CIMICIFUGA, Linn; Gen. Pl, I, 9.

III3

Cimicifuga fœtida, Linn.; Fl Br Ind, I, 30; RANUNCULACEÆ.

Vern — Yunkti, Pa

References. — Stewart, Pb Pl, 2, Treasury of Botany, Kew Official Guide to the Museum, 8.

Habitat — Found in the temperate Himalaya, from Bhutân to Kashmir; altitude 7,000 to 12,000 feet.

MEDICINE.
Root.
III4

Medicine. — The root is said to be poisonous. In Siberia it is used to drive away bugs and fleas. Under the name of a nearly allied plant (*Actæa spicata*), the writer has already referred to this plant, and chiefly with the view of attracting attention to these useful but apparently neglected plants.

Garrod, in his *Materia Medica*, calls *Cimicifuga racemosa*, Linn, the Black Snake Root, and remarks that it is a remedy much used in America. He gives the dose of the tincture as 30 to 40 minims. He remarks "Its use is said to have been attended with much success in rheumatic fever, in chorea, in lumbago, and in some forms of puerperal hypochondriasis." The *Pharmacographia* gives the history of *C. racemosa*. It was first made known to Europe in 1696, and was scientifically identified and named by Linnaeus in his *Materia Medica* in 1747. In 1823 it was introduced into medical practice in America, and to England in 1860.

There seems every reason to expect that the Indian species, which differs from *C. racemosa* only very slightly, will be found to possess all its med.

C. III4

CINCHONA.

Cinchona Bark.

compiling the present article, but has at the same time verified the historic and other facts by consulting the works enumerated above.

Habitat—Dr King says "The trees producing the medicinal barks are all natives of tropical South America, where they are found in the dense forests of the mountainous regions of the western parts of that continent at a height of from 2 500 to 9,000 feet above the level of the sea, and in an equable but comparatively cool climate. The Cinchona producing region forms a crescentic zone which follows the contour of the coast line, but nowhere actually touches it, beginning at 10° N and extending to 20° S latitude. The crescentic belt is nowhere much above a hundred miles in width, but its length (following its curve) is more than two thousand. During its course, it passes through the territories of Venezuela, New Granada, Ecuador, Peru, and Bolivia."

"It must not be supposed that each of the medicinal species is to be found growing throughout the whole length of the zone just described, on the contrary, the distribution of the various species is very local, not only as regards latitude, but as regards elevation above the sea. The species found in the region between 10° N and the equator (the barks of New Granada) were described by Mutis in the last century, and more recently by Karsten in his *Flora Colombica*. Mutis' notes remained in manuscript until 1867, when Mr Clements Markham succeeded in unearthing and printing them, and both his notes and drawings have still more recently been published at Paris by M. Triana in his *Nouvelles Etudes sur les Quinquinas*. The Cinchonas of the region between the line and 14° S (the barks of Ecuador and Northern Peru) were first examined by Ruiz and Pavon and a magnificent work founded on Pavon's specimens was published by Mr J E Howard in 1862, while those indigenous in the region from the fourteenth parallel of south latitude to the extremity of the zone in 20° S were described by M Weddell in his splendid monograph published at Paris in 1849."

HISTORY

HISTORY OF THE INTRODUCTION OF THE DRUG INTO EUROPE

"The introduction of the medicinal Cinchona bark to Europe was effected by the Countess of Chinchon, wife of a Spanish Viceroy of Peru. This lady having been cured by its use of an attack of fever contracted while in that country, brought a quantity of the bark to Europe on her return from South America, about the year 1639. Jesuit missionaries appear also to have taken an active part in its introduction. Hence the early names given to the medicine were *Peruvian* or *Jesuit's bark*, and *Countess's powder*. Nothing, however, was known to science of the tree producing this bark until 1739, when La Condamine and Jussieu, members of a French exploring expedition then in South America, obtained plants with the intention of sending them to the *Jardin des Plantes* at Paris, but the whole collection unfortunately perished in a storm at sea near the mouth of the River Amazon. The first living Cinchonas ever seen in Europe were some *Calisaya* plants raised at the *Jardin des Plantes* from seeds collected by Dr Weddell during his first journey to Bolivia in 1846. In 1742 Linnaeus established the botanical genus *CINCHONA*, a term which continues to be employed by the majority of botanists, although some writers (more particularly Mr O R Markham, CB) prefer the name *Chinchona*, as more accurately perpetuating that of the noble lady who introduced this invaluable remedy to Europe" (King).

HISTORY OF THE ALKALOIDS—"The most important and at the same time peculiar constituents of Cinchona barks are the alkaloids

History of the Alkaloids

CINCHONA

enumerated in the following table:—

Alkaloid	Chemical composition
Cinchonine	$C_{20}H_{21}N_2O$
Cinchonidine (quinine of many writers)	Same formula
Quinine	$C_{20}H_{21}N_2O_2$
Quinidine (conquinine of Hesse)	Same formula
Quinamine	$C_{20}H_{23}N_2O_2$

HISTORY
OF THE
ALKALOIDS.

"There are other crystallizable alkaloids, but they have no medicinal value so far as is yet known, and there is a non-crystallizable alkaloid which has febrifugal power. These alkaloids exist in the bark in combination with certain organic acids called *kinic*, *cinchoyonic*, and *quinic*. Of the alkaloids above mentioned the most

Although Cinchona barks have been

for the past two centuries it was not

several active principles to which they

separate form. The first to be so separated were quinine and cinchonine

Quinidine was discovered in 1833 and cinchonidine not until 1847

Quinamine was discovered so recently as 1872 by Hesse in bark of

C. *peruviana* grown in S. I. I.

to 1
of
to 2
for

very close and no antiseptic has been used.

of the medicinal services of the three Indian Presidencies. Cinchona bark still continues to be rated by the European quinine-makers in proportion to the percentage of quinine it contains, the other alkaloids being counted for little or nothing as marketable products. These unsaleable alkaloids have accordingly been accumulating in the hands of makers in Europe, and are purchaseable at a comparatively low price. Regarding

to Karsten. He ascertained that barks of one district were sometimes devoid of quinine, while those of the same species from a neighbouring locality yielded 25 to 27 per cent.

"At of quinine percentage of alkaloids from 11.96 for which 0.3 per cent. of quinine

CINCHONA.

Cinchona Bark.

... but has at the same time verified the his-
 ... above.
 ... medicinal barks
 ... are found in the
 ... ern parts of that
 ... the level of the
 ... sea, and in an equatorial
 ... The Cinchona-
 ... producing region forms a crescentic zone which ... as the contour of
 ... the coast line, but nowhere actually touches it, beginning at 10° N. and
 ... extending to 20° S. latitude. The crescentic belt is nowhere much above
 ... a hundred miles in width, but its length (following its curve) is more
 ... than two thousand. During its course, it passes through the territories
 ... of Venezuela, New Granada, Ecuador, Peru, and Bolivia."
 ... "It may be supposed that each of the medicinal species is to be
 ... north of the zone just described; on
 ... species is very local, not only
 ... above the sea. The species
 ... of New
 ... cently
 ... script
 ... and
 ... cently
 ... printing them; and would
 ... been published at Paris by M. Triana in his ... sur les
 ... *Quina*. The Cinchona of the region between the line and 14° S.
 ... (the l ... Peru) were first examined by Ruiz
 ... and P ... specimens was
 ... published by M ... enous in the
 ... region from the fourteenth parallel of ... extremity of
 ... the zone in 20° S. were described by M. Weddell in his splendid mono-
 ... graph published at Paris in 1849."

HISTORY.

HISTORY OF THE INTRODUCTION OF THE DRUG
INTO EUROPE.

"The introduction of the medicinal Cinchona bark to Europe was
 effected by the Countess of Chinchon, wife of a Spanish Viceroy of Peru.
 This lady having been cured by its use of an attack of fever contracted
 while in that country, brought a quantity of the bark to Europe on
 her return from South America, about the year 1639. Jesuit missionaries
 appear also to have taken an active part in its introduction. Hence the
 ... the medicine were Peruvian or Jesuit's bark, and
 ... never, was known to science of the tree
 ... hen La Gondamine and Jussieu, mem-
 ... d ... in South America, obtained
 plants ... *Plantes* at
 Paris, but the whole collection ...
 near the mouth of the River Amazon. ...
 ... some *Calisaya* plants raised at the *Yarumayo* ...
 ... his first journey to Bolivia in
 ... CHONA, a term
 ... though some
 ... er the name
 ... le lady who
 Cinchona, as ...
 introduced this invaluable remedy to Europe."

HISTORY OF THE ALKALOIDS.—"The most important and at the
 same time peculiar constituents of Cinchona barks are the alkaloids

History of the Alkaloids

CINCHONA.

enumerated in the following table:—

Alkaloid	Chemical composition
Cinchonine (quite free of many waters):	$C_{20}H_{24}N_2O$
Quinine (free of many waters):	$C_{20}H_{24}N_2O_2$
Cinchonidine (free of many waters):	$C_{20}H_{24}N_2O_2$
Quinidine (free of many waters):	$C_{20}H_{24}N_2O_2$

HISTORY
OF THE
ALKALOIDS.

"There are other crystallizable alkaloids, but they have no medicinal value so far as is yet known, and there is a non-crystallizable alkaloid which has febrifugal power. These alkaloids exist in the bark in combination with certain organic acids called *linic*, *cinchotannic*, and *quinic*. Of the alkaloids alone mentioned the most valued is undoubtedly *quinine*. Although Cinchona barks have been employed in Europe as febrifuges for the past two centuries it was not until the year 1820 that any of the several active principles to which they owe their efficacy was obtained in a separate form. The first to be so separated were quinine and cinchonine. Quinine was discovered in 1821 and cinchonidine not until 1847. Quinidine was discovered so recently as 1872 by Hesse in bark of *C. succirubra* grown in Sikkim.

"Soon after the discovery of quinine, the sulphate of that alkaloid began to be used by the faculty as a medicine in cases where some preparation of 'bark' was required, and gradually the new salt drove out of fashion to a very large extent the powder, tincture, and decoctions of bark which formerly enjoyed such reputation in medical practice. Until the discovery of quinine and cinchonidine, commercial sulphate of quinine consisted really of a mixture of the sulphates of all the Cinchona alkaloids, the outward appearance of these being alike. With the separation of the new alkaloids, chemical tests for their recognition began to be inserted in the various *Pharmacopœias*, and pure quinine began to be insisted on in medical practice. The other alkaloids fell therefore into unmerited neglect, and they were sh *Pharmacopœia* related, has now been them by officers of the medical services of the three Indian Presidencies. Cinchona bark still continues to be rated by the European quinine-makers in proportion to the percentage of quinine it contains, the other alkaloids being counted for little or nothing as marketable products. These unsaleable

devoid of quinine, while those of the same species from a neighbouring locality yielded 3½ to 4½ per cent. of sulphate of quinine.

"Another striking example is furnished by De Vry in his examination of quills of *C. officinalis* grown at Ootacamund, which he found to vary in percentage of alkaloids from 11.96 (of which 9.1 per cent. was quinine) down to less than 1 per cent.

"Among the innumerable published analyses of Cinchona bark, there are a great number showing but a very small percentage of the useful principles, of which quinine, the most valuable of all, is not seldom altogether wanting. The highest yield, on the other hand, hitherto

History of its Introduction into India.

CINCHONA.

the pr
tained
price
munity."

HISTORY
OF THE
INTRODUC-
TION INTO
INDIA.

inferred that Chinese tea plants might be cultivated in the Northern Himalayas."

"Dr. Royle's recommendations, although approved of, were not at the time acted upon, but were allowed to remain in abeyance until 1859.

America for the purpose of exploring the Cinchona forests, and of pro-
cur

an
of 1:
yea

Dr. J. Thomson (his successor at the Calcutta Garden) again pressed the matter, as also did the late Dr. T. Anderson. The Medical Board supported the proposals of these officers in an elaborate minute. It was not, however, until 1858 that the despatch of a special agent to South

Cinchonas) in the forests of Bolivia and Southern Peru, where alone it is to be found. He arranged that Mr. Pritchett should explore the grey bark forests of Huanaco and Humalies in Central Peru, and that Messrs. Spruce and Cross should collect the seeds of the red bark tree on the eastern slopes of Chimborazo, in the territory of Ecuador. Mr. Markham has narrated his adventures in an interesting volume in which he has, besides, collected much valuable information concerning the inhabitants and flora of regions he traversed. Landing at Islay in March 1860, Mr. Markham, accompanied by Mr. Weir (a practical gardener), proceeded inland in a north-easterly direction, crossed the two chains into which the Andes are there divided, and, after considerable hardship, arrived in one of the series of long valleys which stretch along the western slopes of the snowy range of Carabaya, and descended to the

CINCHONA.

History of its Introduction into India

HISTORY
OF THE
INTRODUC-
TION INTO
INDIA

great plain of western Brazil. Mr. Markham penetrated this valley (called Timbopata) to a point beyond that reached by the distinguished French traveller, M. Weddell, and by the Dutch Agent, M. Hasskarl; and, notwithstanding that his proceedings were prematurely cut short by a failure in his food supplies, he was successful in collecting 497 plants of *Cinchona Calisaya* and 32 of the less valuable species *ovata* and *micrantha*.

"Instead of sending these plants direct to India, Mr. Markham was compelled by his orders to take them in India via Panama, England, the Mediterranean and the Red Sea, and thus to expose them to transshipments and alterations of temperature which ultimately killed them all.

"About the time Mr. Markham was exploring the yellow bark forests of Southern Peru, Mr. Pritchett was collecting seeds and plants of the species producing grey bark in the forests near Huancayo, in the northern part of the same territory, and was successful in bringing to Lima in the month of August a collection of seeds and half a mile-kind of young plants of the three species *C. micrantha*, *peruviana*, and *nitida*. The task of collecting seeds was completed by Mr. Pritchett in the month of September.

Spruce and

Andes, and

very of your

veyed safely to India by Mr. R. Cross. A quantity of seeds of this species was also collected and sent to India by post. Mr. Cross was subsequently commissioned to procure seeds of the pale barks in the forests near Loja, and this commission he executed with great success. A third expedition to New Granada was made by the same collector with the object of procuring seeds of the species *C. peruviana* and *C. nitida*.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

The seeds of the three species were sent to India by Mr. Cross in the month of January 1841.

introduction of *Cinchona* into India and other British possessions, Government are largely indebted for advice, as well as for more active assistance, to Sir William and Sir Joseph Hooker, the illustrious botanists, father and son, with whose names the fame of the great national institution identified. Those of the grey bark were sent to India in January 1861, and those of the red barks

History of its Introduction into India.

CINCHONA.

two months later. In the month of December 1861, Dr. Anderson delivered over to Mr. McIver at Ootacamund the plants he had brought from the Cinchona plantation which the Dutch had just succeeded in establishing in Java. Dr. Anderson had been sent by the Government of India to visit these plantations, and by the courtesy of the Dutch authorities he was allowed to take away with him 50 plants of *Cinchona Calisaya*, four plants of *lanceifolia*, and 284 plants of *Pahudiana*. On the 4th March 1862, Mr. Cross' collection of pale or crown bark seeds from Loxa arrived, and the introduction of Cinchona to India became thus an accomplished fact" (King).

Introduction into South India.—"The success of *Cinchona succirubra* and *officinalis* on the Nilgiris has been remarkable. Not only do the trees grow luxuriantly, but their bark is richer in alkaloids than much of the *Cinchona* bark imported from South America. The Government

HISTORY
OF THE
INTRODUC-
TION INTO
INDIA

South India.

Lawson.

"Encouraged by its success on the Nilgiris, Cinchona cultivation was warmly taken up by European residents in the other high lands and hill ranges of the Madras Presidency. The coffee planters of Wynad put out a good many red bark trees on their estates, and these are found to grow well. In South Canara a small plantation was formed in 1869, at a place called Nagooli, above the Kolor Ghât, and at an elevation of 2,500 feet above the sea; but the experiment there was pronounced by the Madras Government as unlikely to be productive of useful results, and was abandoned. On the Mahendra Mountain, in the Ganjam district, the Madras Government the Forest Department the Nulla Mully

and the Government" (King).

perintendence of Mr. Cross, to England, and from thence they were transported through the Red Sea to India. Here 463 arrived in good condition. These were taken to the Nilgiri Hills, the district previously selected by Dr. Royle as that in which the different varieties would most probably thrive best. For the hardier kinds Mr. Markham selected a site near the top of Dodabetta, the highest rounded knoll of which is about 8,700 feet above the level of the sea, while for the more tender sorts he selected a tract of country about Naduvatom, a small Toda village which lies on the edge of the hills facing the west, and which ranges between 5,500 and 6,000 feet. The plants, on their arrival, were handed over to Mr. W. G. McIver, who, for some time previously, had held the appointment of Superintendent of the Government Gardens at Ootacamund, and it is to his care and sagacity that the rapid, enormous increase of the plants is due. Easy as it is now found to propagate and rear the different kinds of Cinchona, it ought never to be forgotten that

CINCHONA
Calisaya.

The Yellow Bark of Commerce.

HISTORY
OF THE
INTRODUC-
TION INTO
INDIA.

taken up with great vigour by the very spirited planting community of that then most distant colony. . . .
tion : . . .
dry (. . .
subse . . .
the years 1805-06-07, Dr. King informs the writer the annual exports from Ceylon touched 15 million pounds.

THE SPECIES OF CINCHONA.

There are between 20 and 30 species of *Cinchona* . . .
ous hybrids and vari . . .
that some doubt may . . .
species many forms of . . .
barks are obtained from . . .
being . . .
will be . . .
will be . . .
which are cultivated in India.

III7

Cinchona Calisaya, Weddell; RUBIACEÆ.

THE CALISAYA BARK OF YELLOW BARK OF COMMERCE, a term also applied to the bark of *C. LEDGERIANA*.

Vern.—Burok, Dec.; Shwappattan, Tam.; Gadap-patta, Tel.

References.—*Kew Reports*, 1877, pp. 14, 28, 1879, pp. 12, 13; 1880, pp. 11, 25, 31, 1881, 25; 1882, pp. 18, 19, 38; *Trop. Agriculturist*, 1883, 706.

Habitat.—A very variable tree, with a trunk twice as thick as a man's body when well grown. Cultivated in Sikkim at moderate elevations. Dr. King, in a report dated 1872, says: "This plant yields the yellow bark of commerce, and is a sort second to none in value; it promises to do well in Sikkim. From the difficulty of propagating this species artificially, the progress made hitherto has been slow." Since the above was written the cultivation of this species has been so successfully extended that it is at most only second to *C. succirubra* in point of importance in the Sikkim plantations. In a Resolution of the Bengal Government dated March 1888, it is stated that Mr. Wood was of opinion that good quinine barks . . .
Superintendent of the planta-
1875 he recommended that
cease. This recommenda-
tion was not acted upon for some time. Full effect has, however, been given to it of recent years and cultivation has been supplanted by *Calisaya* to the extent of . . . other hand, the
attempt to cultivate this . . . been practically
abandoned. *Calisaya* . . . in 1847; it is a
native of Bolivia and : . . . rk from natural
sources is uncertain.

MEDICINE.
Bark.
III8
Powder.
III9
Leaves.
III20

Medicine.—This yields one of the most valuable of the *Cinchona* barks, rich in alkaloids, among which quinine forms $\frac{1}{2}$ to $\frac{3}{4}$. The BARK and . . .
and
inine.

of this
bark: "Two varieties of *CALISAYA* bark are distinguished in commerce,—
flat and quilled. Flat *Calisaya* bark is flat or nearly so. It is generally

C. III20

The Ledgeriana Bark of Commerce.

CINCHONA
Ledgeriana.

uncoated, consisting almost entirely of liber; is $\frac{1}{2}$ to $\frac{1}{4}$ inch thick. Its

MEDICINE.

curved or twisted pieces. *Quina Calisaya* occurs in tubes $\frac{1}{2}$ to 12 inches

Flax of the Pharmacopœia.

Structure of the Wood.—Reddish-grey, moderately hard, even-grained. Pores small, in short radial lines. Medullary rays fine, closely packed

TIMBER.
1121

VARIETIES OF C. CALISAYA.

Numerous varieties and hybrids have been distinguished of this species, especially by Weddell. The best known are *var. Josephiana* (named after

Josephiana.

1122

Zamba.

1123

Morada

1124

Verde.

1125

Blanca.

1126

consists mostly of *C. Calisaya*, in which quinine is the chief alkaloid." "The Java Cinchona barks are celebrated in Europe for their superior outward appearance and have been able to command a high price. I do not know how far that superior outward appearance may be dependent on the manner of harvesting, drying, and packing, but certain it is that their treatment is highly spoken of." "There are numerous varieties of *C. Calisaya*, but we possess one with which we have become acquainted, especially from the numerous analyses of Mr. Moens, and which produces a superior manufacturing bark."

The variety known under cultivation as *C. Ledgeriana* may now be separately alluded to

Cinchona Ledgeriana (a cultivated form).

1127

planters. It is, however, a small tree when compared with other kinds of Cinchonas, and consequently the amount of bark harvested in a given number of years is much smaller than that taken from other kinds. The bark also, when it is renewed, is less rich in quinine than the natural bark, so that the trees, instead of having their bark improved by the process of

C. 1127

CINCHONA
officialis

Loxa or Crown Bark of Commerce

stripping, as is the case in the other kinds of Cinchona, decrease in value. These two circumstances make it doubtful if plantations of *C. Ledgeriana* will, in the long run, be much more profitable to the planter than those formed of the more robust kinds, although the bark of the latter may have a lower percentage of quinine."

During the Colonial and Indian Exhibition several Cinchona experts spoke in the highest terms of this plant. It was urged that its cultivation was certain to prove more remunerative than that of any other species. It could be propagated at lower altitudes than the others (scarcely growing above 4,000 feet), and was, from this point alone, a more economical

2,500 feet
this plant "To-
English traveller.
been collected near
Pelechuco, eastward of the lake Titicaca, about 68° west longitude and 15° south latitude, in the Bolivian province of Canpolican. In the same
sold to the Dutch
and a little later

C. Ledgeriana has since proved by far the most productive in quinine of all Cinchona barks. The tree is a mere form of *C. Calisaya*. Mr Hooper, Quinologist to the Madras Government, in a recent report, remarks "In the Ledger bark it will be noticed that there is a steady rise of quinine up to the age of between five and six years after which there is no apparent increase."

1128

Cinchona carthagena (Commercial name)

This has been successfully introduced into the Nilgiri hills within the past few years, and Mr Lawson alludes to it in his reports. In this valuable Cinchona gain, in 1882-83, the

1129

C. officinalis, Hook

LOXA OR CROWN BARK, the Pale Bark of Commerce

Syn.—*C. CONDAMINEA*, Humb

References—*Year Book of Pharm.*, 1873 447 1875, 161 1878, 444

Habitat—A native of Ecuador and Peru. Cultivated at high elevations on the Nilgiris, in Ceylon, and in Sikkim, but not extensively. "the *C. officinalis*, in its most

to be too moist
by this species is quinine
he Pharmacopœia
similar in structure to that

MEDICINE
Loxa Bark
1130
TIMBER
1131

of *C. Calisaya*

Mr W Elborne describes the bark of this species—

"The bark breaks easily with a fracture which exhibits very short fibres on the inner side. The Loxa bark of commerce is chiefly produced by this species, though occasionally other species of Cinchona contribute to furnish it. At the present day it is scarcely possible to obtain genuine Loxa or Crown bark from South America, India, Ceylon, and Jamaica being the chief sources of the bark in commerce."

C. 1131

Red Bark of Commerce.

CINCHONA
succirubra.

cinchonine.

Cinchona succirubra, Pavon.

RED BARK.

References.—*Year-Book of Pharm.*, 1873, 70-73, 447, 1874, 19-20, 150-154; 1875, 12, 159; *Kew Report*, 1877, 28.

Habitat.—Cultivated on the Nilgiris and other hills of South India; at the plantations of Rangbi and Poomong in Sikkim, on the hills east of Toungoo, in Burma, and in parts of the Satpura Range in Central India.

Mr. Lawson writes of South India, while speaking of *C. officinalis*: "The *C. succirubra*, on the other hand, has a bold sturdy stem, which, in rich soil and sheltered situations, grows to the height of 50 feet or more
made up
nalis looks

grown in Bengal, and *C. officinalis*, while practically a failure in Sikkim, is the chief species grown on the Nilgiri hills, and after that *C. succirubra*, and third in importance *C. Ledgeriana*

Medicine.—This species thrives at a lower elevation than the others, but is comparatively poor in quinine, though rich in cinchonine and cinchonidine. It yields its best bark when eight years old. From it is chiefly derived the "*Cinchona Febrifuge*," which is now largely manufactured at the Government Plantation of Rangbi. Mr. W. Elborne remarks (*Pharm Soc Jour.*). "The experiments of Mr. J. E. Howard and others have proved that the bark of the root contains a larger proportion of alkaloids than that of the stem, and that the proportion of alkaloid diminishes upwards to the branches." Mr. David Howard has also shewn that the nature of the alkaloid varies according to the part of the tree from which the bark has been taken

In the opinion of pharmacists the bark most suitable for medicinal use is the *Cinchona succirubra*. The cause of this preference, as pointed out by Mr. Holmes, are the following (1) the red bark supply will probably be always equal to the demand on account of its growing on a much lower elevation and consequent distribution over a much wider area, (2)

yellow barks for pharmaceutical preparations.

Red Cinchona bark is generally coated, and consists of liber, the cellular and tuberculous coats, and usually more or less of the epidermis, its outer surface is rough, furrowed, and frequently warty, the colour of the epidermis varies from reddish brown to chestnut brown, cryptogamic plants are not so frequent as on some other kinds of bark. The cellular coat of the flat pieces is very thick and spongy. The inner surface of the quills is

1132

MEDICINE.
Red Bark.
1133

C. 1133

CINCHONA
succirubra.

Hybrids of Cinchona

MEDICINE.

ing matter. The black-red coloring matter is not found in the growing plant but in the dried bark, and Mr. J. E. Howard considers that it is really an excretory product of vegetation, a part used up and brought by contact with the air into a state in which it can no longer be serviceable to the living plant, and from which it still degenerates by a still further degeneration into *humus*. It is by a process of *excretion* that the red bark acquires its colour, the cinchoninic acid in which it abounds having become oxidized and changed into cinchonin red, and under these conditions the alkaloids also appear to undergo some corresponding alterations. They are now impregnated with resin which appears to have also become oxidized in order to act the part of an acid, and is with difficulty separated. But the most remarkable feature is the altered condition of the alkaloids themselves. Quinine, which formed a considerable portion of the whole, is now diminished, while cinchonine and cinchonidine remain much the same. The quill red bark of Indian plantations is a much better drug, some of it yielding 5 to 10 per cent. of alkaloids, less

TIMBER.
II34
HYBRIDS.
II35

radial lines; medullary rays, closely packed, fine and very fine.

HYBRIDS OF CINCHONA.

Kuntze, after examining the living Cinchonas in the Indian plantations and working through the collections of dried specimens in the Herbaria and the literature of the species Cinchona, proposed to reduce all to four forms. It has been admitted by most writers that considerable hybridization than do the species submitted to Government in July 1871, furnishes interesting information as to the tendency to hybridism among the species of Cinchona. On this

Angustifolia.
II36Bonplandiana
II37

loids. It has been established that allied to the form Bonplandiana. From the fact that it is reproduced by seed, Mr. Howard suspects that it may be a species not a hybrid. Be

is now extensively propagated on the Nilgiri hills.

About the same period a valuable hybrid appeared in Sikkim among plants reared from Ceylon seed. This is known as "the hybrid" to distin-

C. II37

Chemical peculiarities of the Cinchonas

CINCHONA.

variety
 higher le
 ment of l
 promise
 vigorous growth

appearing
 that the
 2 urita-
 as con-
 v exten-
 is of the
 Since
 ate this

by hybridization or otherwise, so as to produce a plant that will give the maximum of quinine or other alkaloid desired to be obtained

CHEMICAL PECULIARITIES OF THE CINCHONA PLANTS.

We may conclude this account of the forms of Cinchona grown in India by displaying their chemical peculiarities in the following table of comparative analysis taken from Mr Lawson's report.—

CHEMICAL
PECULIARITIES
1138

The Analysis of the different kinds of barks grown on the Government estates given below, have been made during the past year by Mr. Hooper, the Government Quinologist

		Quinine	Cinchonine	Quindine	Cinchonine	Amorphous alkaloids	Total	Sulph quinine
1	C. officinalis natural	2 77	1 57	16	39	50	5 30	3 72
2	" mossed	3 40	1 50	20	45	62	6 17	4 57
3	" renewed	4 11	85	22	65	70	6 63	5 66
4	C. angustifolia, natural	3 97	1 32	12	12	87	6 40	5 34
5	" mossed	5 60	1 41	33	04	97	8 35	7 53
6	" renewed	4 91	89	38	19	1 14	7 51	6 60
7	C. succirubra natural	1 91	2 11		1 14	88	6 04	2 57
8	" mossed	1 69	2 03		1 63	98	6 38	2 27
9	" renewed	1 84	1 48		1 25	71	5 28	2 47
10	" branch	1 38	2 28		1 59	1 16	6 41	1 85
11	" root	1 24	27	41	1 43	1 27	5 12	1 66
12	" renewed shavings	2 30	1 16		2 06	1 45	6 97	3 09
13	C. robusta natural	1 43	2 08		1 58	31	5 40	1 92
14	" mossed	1 92	3 16		77	35	6 20	2 58
15	" renewed	4 40	2 54		51	1 65	9 10	5 92
16	" branch	1 64	2 71		1 17	50	6 02	2 20
17	C. micrantha natural				1 92	40	2 32	
18	" renewed	tr	2 45		1 12	1 02	4 59	
19	" branch				1 60	45	2 05	
20	C. Calisaya natural	1 21	2 32		2 13	29	5 95	1 62
21	" branch	59	73		1 93	48	3 73	79

CINCHONA

Chemical Peculiarities of the Cinchonas.

CHEMISTRY

Analyses of different kind of barks grown on Government estates, &c.—*contd.*

		Quinine	Cinchonidine	Quinidine	Cinchonine	Amorphous alkaloids	Total	Sulph quinine
22	C Calisaya var Anglica, natural	81	88	29	1 49	44	3 91	1 09
23	" " branch	tr	tr	25	2 04	36	2 65	
24	C Ledgeriana, natural	5 49	1 33		8-	88	8 52	7 38
25	" " branch	2 21	49		1 07	50	4 7	2 97
26	C Javanica natural			1 32	2 64	48	4 44	
27	" " branch			1 43	1 49	45	3 37	
28	C Humboldtiana, natural	2 24	1 55	tr	49	90	5 18	3 01
29	" " renewed	1 28	64		43	1 07	3 43	1 72
30	C pitayensis natural	2 34	56	1 10	1 93	39	6 32	3 14
31	" " mossed	3 81	95	63	1 01	37	7 67	5 12
32	" " renewed	2 50	52	78	2 33	55	6 68	3 36
33	C nitida	1 42	2 45		1 45	67	5 99	1 01
34	Pahudiana natural	04	10		39	43	96	05
35	" " renewed	51	1 19		28	87	2 85	68

Dr King furnishes the following analysis of the yellow and hybrid barks of Bengal —

'The Sikkim plantations produce red and yellow barks. Of the yellow barks the following four analyses may be taken as characteristic.—

Yellow Bark—(Sikkim).

Crystallized Sulphate of Quinine	3 93	4 83	6 04	3 49
Ditto of Cinchonidine	0 36	0 51	0 97	0 32
Ditto of Quinidine	traces	0 06	0 04	0 25
Cinchonine	0 17	0 21		

"But besides red and yellow bark the Sikkim plantations now produce a large quantity of hybrid bark, the composition of which may be seen from the following analysis of four samples —

Hybrid Barks—(Sikkim)

Crystallized Sulphate of Quinine	6 12	3 99	3 12	3 24
Ditto of Cinchonidine	2 46	3 33	1 21	2 46
Ditto of Quinidine	traces	traces	0 30	
Cinchonine (alkaloids)	0 55	0 57	0 71	0 52"

CLIMATE, SITUATION, AND SOIL SUITABLE FOR CINCHONA CULTIVATION

Dr King's account of these is as follows —

"With regard to the climate suitable for Cinchonas, it may be laid down as a universal rule that none of the medicinal species will stand frost. They prefer rather a cool climate, in which the contrast between summer and winter and between day and night temperatures is not very great. These conditions are in some measure obtained in the Nilgiris and in Sikkim. At Ootacamund about 7,500 feet above the sea, the minimum lowest temperature in the shade, calculated on an average of the three years is about 49° and the maximum 69° Fahrenheit, and at Neddawattum, situated about 7,000 feet lower, the minimum, calculated also over three years, is found to be about 54° Fahrenheit, and the maximum 66° Fahrenheit. Observations taken in 1866 and 1867 at an elevation of 3,332 feet

CULTIVATION.

In Bengal
1139

CINCHONA.

Methods of Propagation in India.

CULTIVATION.

braks thrive well from 1,500 to 3,500 feet, and can be got to grow both as low as 800 feet and as high as 5,000 feet; *Calisaya* thrives between 1,500 and 3,000 feet; officinally does not thrive at any elevation.

"All the growing new most important of constant moisture at their roots."

better in newly-cleared forest than in grass lands of the sort so extensive in the Nilgiris. The brown or pale barks, however, are more tolerant than t

grass

open

cessful growth. As soon as the roots in a *Cinchona* ... into subsoil in which there is any tendency for moisture to collect, the plant most certainly begins to sicken and die. The basis of the soil of the Nilgiris is decomposed gneiss; in Sikkim it is composed both of gneiss and of decaying mica schist."

PROPAGATION,
Bengal.
1140

METHODS OF PROPAGATION IN INDIA.—Dr. King writes:—

they will germinate at a ... by cuttings or seeds. un- seeds but

The most efficient mode of sowing them is in open beds which are sheltered by thatched roofs. The seeds must be sown in fine, rich, thoroughly-decayed vegetable mould, either pure or mixed with an equal volume of clean sharp sand which does not feel clayey or sticky when a little of it is taken up and compressed between the fingers. Mould of this sort can usually be easily collected in the forest, and is specially abundant at the base of old clumps of bamboo. After being sifted, the soil so collected should then be spread in layers about two or three inches in depth and five feet wide on beds of ground which have been previously well cleared so that no water whatever may lodge should be protected from rain and e sloping thatch. The surface of the

and afterwards a very

It is not desired to cover the seeds, but merely to steady them by a little earth above them here and there, so as to get them into proper contact with soil. Water should be given by means of a very finely drilled syringe. The seeds will germinate in from two to six weeks. When the

with es at es of

when picked out, the plants should remain

but for the past twelve years a distance of

C. 1140

Mode of Collecting the Bark.

CINCHONA.

adopted. The red bark, even in South America, is never a large tree; *Cinchona officinalis* is but a big shrub, and it is doubtful whether in India *Calisaya* will ever attain any very great size. Wide planting is therefore obviously an error. All the *Cinchona*s, moreover, have the habit of throwing out a quantity of superficial rootlets, and young *Cinchona* plantations do not thrive until the soil between the trees is sufficiently protected from the sun to allow these superficial rootlets to perform their functions freely. The growth of weeds is also checked by shade. By close planting, therefore, two desirable objects are speedily obtained, and moreover, the trees are encouraged to produce straight clean stems. As the

PROPAGATION.

quantity
positive

method
ted very

In
Madras,
1141

readily by seed or cuttings. The former mode is usually adopted for the sake of cheapness, while the latter is only resorted to when it is desired to obtain a stock of some well-known variety very rich in particular alkaloids. The seed is sown broadcast in beds specially prepared and made of rich leaf-mould. They are protected from the sun by light *fundals*, that is, by a thitch of ferns or mats raised 3 feet above the beds, or by branches

thick to completely shade

seedlings are pricked out

When they have grown

if the pits are extremely in number
showers have set in, the plants,

destruction from the ordinary

climatic changes, and, at the expiration of four or seven years, according to the species, they will yield their first harvest of bark."

MODES OF COLLECTING THE BARK.

COLLECTION.

In Bengal—"Various methods of harvesting the bark crop have been adopted. On the Sikkim plantations, the most profitable has been found to be the complete uprootal of the trees, and the collection of the whole of the bark from root, trunk, and branches. A modification of this, which has also been practised there as well as on some of the plantations in South India and Ceylon, is coppicing. It does not, however, by any means invariably happen that the stools yield coppice; for they not unfrequently die, in which case the whole of the root-bark is lost; for the bark of any dead part of a *Cinchona* tree is always destitute of alkaloids.

Bengal
1142

"So long ago as 1863, the late Mr. Melver discovered that, if a portion

of bark from a dead to a many from living trees, and on covering the

CINCHONA.

Methods of Propagation in India.

CULTIVATION.

braks thrive well from 1,500 to 3,500 feet, and can be got to grow both as low as 800 feet and as high as 5,000 feet; *Calisaya* thrives between 1,500 and 3,000 feet; *officinalis* does not thrive at any elevation.

"All the species are most impatient of stagnant moisture at their roots, and therefore require an open subsoil, a sloping exposure, and the other conditions of perfect drainage. They cannot be got to grow on flat land. Like most other plants, they prefer a rich soil, and for this reason they do better in newly-cleared forest than in grass lands of the sort so extensive in the Nilgiris. The brown or pale barks, however, are more tolerant than the other."

grass land.

open well-dr

cessful growth

subsoil in which there is any tendency for moisture to collect, the plant most certainly begins to sicken and die. The basis of the soil of the Nilgiris is decomposed gneiss; in Sikkim it is composed both of gneiss and of decaying mica schist."

METHODS OF PROPAGATION IN INDIA.—Dr. King writes:—

PROPAGATION,
Bengal,
1140

by decayed vegetable mould, either pure or mixed with an equal volume of clean sharp sand which does not feel clayey or sticky when a little of it is taken up and compressed between the fingers. Mould of this sort can usually be easily collected in the forest, and is specially abundant at the base of old clumps of bamboo. After being sifted, the soil so collected should then be spread in layers about two or three inches in depth and

It is not desired to cover the seeds, but merely to steady them by a little earth above them here and there, so as to get them into proper contact with soil. Water should be given by means of a very finely drilled syringe. The seeds will germinate in from two to six weeks. When the

out in the same manner as before, only at distances of about 4 to 4 inches each way. When from 9 to 12 inches in height, the seedlings are ready to occupy.

at distances of
and latterly at
15 six by six feet,
but for the past twelve years a distance of four by four feet has been

Mode of Collecting the Bark.

CINCHONA.

Peruvia, is never a large tree; it is doubtful whether in India. Wide planting is therefore moreover, have the habit of throwing out a quantity of superficial rootlets, and young Cinchona plantations do not thrive until the soil between the trees is sufficiently protected from the sun to allow these superficial rootlets to perform their functions freely. The growth of weeds is also checked by shade. By close planting, therefore, two desirable objects are speedily obtained, and moreover, the trees are encouraged to produce straight clean stems. As the trees begin to press on each other, they can be thinned out, and a quantity of bark may thus be got at a comparatively early period, with positive advantage to the plants that are allowed to remain on the ground."

In Madras—Mr. Lawson gives the following account of the method pursued in South India. "All the Cinchonas may be propagated very readily by seed or cuttings. The former mode is usually adopted for the sake of cheapness, while the latter is only resorted to when it is desired to obtain a stock of some well-known variety very rich in particular alkaloids. The seed is sown broadcast in beds specially prepared and made of rich

PROPAGATION.

In
Madras.
II4I

9 inches or a foot in height they are ready to be planted out in the estate. This is always done in wet and cloudy weather, and each plant is immediately protected with a little dome of fern. If this is not done, and the sun scorches the plants before they are well-rooted, their destruction is certain. For each plant a pit 2 feet cube is dug some months beforehand, so that the soil, when it is returned to the pit, is well aerated and pulverized. As all Cinchonas are lovers of rich food, their well-being in the early

MODES OF COLLECTING THE BARK

In Bengal—"Various methods of harvesting the bark crop have been adopted. On the Sikkim plantations, the most profitable has been found to be the complete uprootal of the trees, and the collection of the whole of the bark from root, trunk, and branches. A modification of this, which has also been practised there as well as on some of the plantations in South India and Ceylon, is coppicing. It does not, however, by any means invariably happen that the stools yield coppice, for they not unfrequently die, in which case the whole of the root-bark is lost for the

COLLECTION.

Bengal
II42

CINCHONA.

Treatment of the Removed Bark.

COLLECTION.

stems that had been operated upon with a coating of moss or straw in order to exclude light. The results of this process were very satisfactory both in the Nilgiris and Ceylon. It was also discovered that, provided natural shade be afforded, the treated trees with the

all the young wood be laid on the ground, the trees thus treated gradually acquire their former thickness, and that the renewed bark is richer in alkaloids than the original bark. This process has been successful in India, and also in the Nilgiris and Ceylon" (King).

was not resorted to in the case of the bark under the name of "ants" (Reso-

In
Madras,
II43

etail (than in the Govern-
The barker,
with the sharpened point of an ordinary pruning knife, makes several cuts running down the stem parallel to each other, about an inch apart, and then with the blunt back of his knife, he raises every alternate narrow strip and removes it from the stem, so that the bark is left in strips to crush through the layer

injured, a new bark has been taken away. If, on the other hand, the layer of cambium cells is crushed or scratched off by clumsy workmanship, no new bark will be formed. In order to facilitate this new formation of bark, the stem is covered with moss, grass, leaves of the New Zealand flax (*Phormium tenax*) or some

so as to form a new bark. The tree should then be manured, if possible, and allowed to remain for three years, after which those intervening strips of bark which were left on the tree are removed. And this process

is cut down and one or more shoots are allowed to spring up from its stool.

TREATMENT

Bengal.
II44

TREATMENT OF THE REMOVED BARK.

In Bengal—"After removal from the trees, Cinchona bark has to be carefully dried, and on the best modes of doing this careful experiments have been made. From these it has been found that exposure to a high

Diseases of Cinchona Trees.

CINCHONA.

temperature, especially in a moist atmosphere, causes bark to become almost worthless. Even the sun's rays are hurtful, if bark is long exposed to them. To secure it in the best possible condition, bark should be taken off the trees in large pieces, and these should be arranged on drying stages, under shelter from the light and heat of the sun's rays, but freely open to the access of air. The pieces should be frequently turned. Bark should be taken off in dry weather only. If allowed to become mouldy

weather, off during wet
the other Dry bark, on
calculate "Mr. Broughton
nt of weight in

drying, and branch bark from 75 to 76 per cent. The Sikkim experience goes to show that trunk red bark loses 73 per cent, and twig bark 75 per cent" (King)

In Madras—"After the bark is removed from the trees it is dried by the sun or by artificial heat. It is then packed in gunny bags, forming bales containing 100 lb of the bark. It is then despatched for sale, and sold either locally in Madras or in London" (Lawson). Mr. Broughton

TREATMENT OF BARK.

In
Madras.
II45

bark of opposite sides of the same tree differs in yield of alkaloids. This is, of course, only if the bark is taken from trees that are all exposed to sunlight on each side. This generally occurs, and shows that the bark which for four months was more exposed to the sun than the south—afforded 68 per cent. less alkaloid

DISEASES OF THE CINCHONA TREES.

DISEASES.
II46

"Cinchona trees are liable to a kind of canker, which often destroys the terminal and lateral branches, and not unfrequently kills the plants outright. This canker is most abundant in situations where the subsoil is

... subjects of special enquiry by the Cinchona Commission which sat in 1871. The late Mr. Melver reported to the

... and that the Cinchona industry of Bengal had if anything less to fear from disease than almost any other branch of agricultural enterprise. Dr. King, in the correspondence alluded to, established two diseases "one, a constitutional malady affecting the whole plant and usual

CINCHONA.

Diseases of Cinchona Trees

DISEASES

is fatal, the other local and by no means fatal. The former disease is confined entirely to trees which have been originally planted in damp situations, or in situations which have become damp subsequently by the soaking of drainage water in the way already explained. Disease first attacks the roots of such trees. Its existence becomes apparent by the discolorization of their leaves, which ultimately fall off. Gradual swelling of the cortical and woody tissues then takes place from the root upwards, and before this process has gone far the death of the plant has begun. This disease is in fact apparently nearly identical with that known to gardeners in England as 'Canker'. It is not in any way infectious or contagious, as some appear to think. It depends entirely on a local cause, namely, excess of moisture in the soil; and where that does not exist, it cannot occur. "The second form of disease does not affect the entire constitution of the plant, but manifests itself in patches on the stem and branches. The appearance of one of these patches is as if some excrement had been dropped on the bark, which is of a dark unnatural colour, shrivelled, dry, and brittle, occasionally these appearances extend to the wood, but as a rule they do not. In size the patches vary, many are about the size of a shilling, others are much larger. They are not numerous on one tree and are often confined to a single branch. When small no apparent affection of the general health of the plant occurs, and growth goes on unchecked. When, however, a large patch occurs on a small tree involving the bark pretty nearly all round the stem, death results. Death from this disease is, however, as far as my observations go not common and it is a well-established fact that a tree which has been extensively affected will, when cut down, throw up from its stump perfectly healthy shoots, while in hundreds of trees at Rangbi, I have seen illustrations of recovery, the little patches of diseased bark being thrown off and replaced by perfectly healthy tissue, and the plant apparently as robust as if it never had been attacked." Dr King adds that the disease is most prevalent during the rains, and that he is not prepared with any theory as to its cause. "This disease is not confined like the last to certain spots, but is found on plants in all parts of the plantation."

A careful examination of all that has been written and of the evidence recorded before the Cinchona Commission, leads to the conclusion that the two diseases distinguished by Dr King were by the earlier observers viewed as one and the same. If anything, Mr McIver and most other writers allude to the second disease,—the professional gardeners and Cinchona planters assigning as a cause the damp soil to which Dr. King attributes the first disease. The late Mr Scott in his evidence before the Commission, attributed, as a probable cause of the disease of the bark, the excessive humidity of the atmosphere checking the transpiration and retarding thereby the circulation of the sap—an effect which he thought might cause extravasation of sap into the tissue, and thus produce the isolated patches of disease. This explanation would be in keeping with Dr King's observation, that it is more prevalent during the rains and would at the same time point to the conclusion that in point of humidity Sikkim possesses about the maximum that the Cinchona plant can be successfully propagated under. This idea receives further support from the fact that, while *Cinchona succubra* and *C. Callisaya* can be readily propagated in Sikkim, *C. officinalis* cannot, but that species has been most successfully grown on the less humid slopes of the Nilgiri hills.

It may be concluded that, with care in the selection of sites and the more perfect system of cultivation now pursued, all danger from disease has been practically removed.

Government Cinchona Febrifuge and Quinine

CINCHONA.

ANNUAL YIELD OF BARK.

In Bengal—The outturn of bark from the Government plantation was, in 1885 86, 339,201lb, bringing the total yield of bark up to 3 256,927lb. Almost the whole of this large amount has been used up in the manufacture of the Government Cinchona Febrifuge—a medicine of which, during the past eleven years, 68,473lb has been used up in India (for the effect of these on the imports of Quinine see the two concluding paragraphs of this article). The yield of bark shown above for Bengal,

YIELD.

Bengal.
1147

Madras
1148

price realized per bale about R100, but in the course of a few years, when the estates have been restored to their former prosperous condition, the amount of bark annually taken will be greatly increased" (Lawson)

RESPECTIVE VALUE OF THE ALKALOIDS

VALUE OF ALKALOIDS

"As has been already explained, the medicinal crystallizable alkaloids contained in the bark are quinine, cinchonidine, quinidine, and cinchonine, together with an amorphous alkaloid. A fifth called aricine is occasionally found, but has never been used in medicine. M Hesse has also recently announced the existence of another alkaloid occurring only in the *succirubra* bark grown in Sikkim. This base has received the name of quinamine. As everybody knows, it is the first named of these which has hitherto formed the specific for malarious fever. Bark for the manufacture of this alkaloid consequently brings a price in direct proportion to the amount of quinine contained in it. The barks of *Calisaya officinalis* and

always been much esteemed, and of late years (since it began to get scarce) has brought a price as high or even higher than that got for the barks richer in quinine" (King).

GOVERNMENT CINCHONA FEBRIFUGE AND QUININE

FEBRIFUGE.
1149

"It had for many years been suspected that the other alkaloids in which red bark is so rich are nearly, if not quite, as efficacious febrifuges as quinine. The settlement of this point naturally demanded attention

given in the following extracts from their reports —

"In regard to the relative effects of the three new alkaloids, and with them chemically pure sulphate of quinine, the evidence derived from their use shows that with the exception of sulphate of cinchonine, as

CINCHONA.

Government Cinchona Febrifuge and Quinine.

FEBRIFUGE.

power, and in equal circumstances their use produced almost the same physiological results.

"The result of the Commission last year, and the Commission of the year 1877, the Commission of the year 1878, and the Commission of the year 1879, all of which ordinary sulphate of quinine, and sulphate of quinine possess equal febrifuge power, that sulphate of cinchonidine is only slightly less efficacious, and that sulphate of cinchonine, though considerably inferior to the other alkaloids, is, notwithstanding, a valuable remedial agent in fever.

"There is no longer room to doubt that the alkaloids are capable of being generally used with the best effects in India. They have been compared with quinine, a drug which possesses, more than any other that can be named, the confidence of medical practitioners here; and have been found by more than one observer, to supplement this sovereign remedy in some of its points of deficiency. The risk attending their use is clearly not greater than in the case of quinine, nor such as to be in any way deterrent; while the diversities of opinion on their relative usefulness and any

and other hand, rich in crystallizable quinine, and is nearly as highly valued by the quinine-maker as good American yellow. The establishment of the therapeutic excellence of these alkaloids largely increased the value of the red bark plantations in India, and made much easier of solution the problem of supplying its fever-stricken population with a cheap and effectual febrifuge. And for the solution of this problem the Government very speedily took active steps, by appointing Mr. J. Broughton, a

the Nilgiri plant-observations on ss for extracting the whole of the alkaloids from succubra bark, retired from the service of Government about 1877. The manufacture of Mr. Broughton's amorphous quinine was, however, discontinued on the departure of Mr. Broughton, and since then the whole of the bark produced on the Nilgiri plantations has been disposed of by sale. In 1873, Mr. O. H. Wood was appointed to the position of Government Chemist at Sikkim, and by mixed alkaloids

febrifuge. The methods in use for the extraction of the alkaloids from Cinchona bark depend, first, on the displacement of them from their position with dissolving the spirit

if preparing the febrifuge as follows:—"The dry bark is crushed into small pieces

Government Cinchona Febrifuge and Quinine

CINCHONA.

1 casks, where it is macerated
The liquor is then run off into
of a strong solution of caustic
soda a precipitate forms which is collected on calico filters, and well washed
ed with water. The precipitate is then dried at a gentle heat and powdered
d to a process of
crude product is
y of a solution of
sulphur in caustic soda is added to the liquor. After the lapse of 24
hours the liquor is carefully filtered. The filtrate is mixed with caustic
collected on calico and washed with a
1 powdered it is then ready for issue
CINCHONA FEBRIFUGE

FEBRIFUGE

QUININE.—By a Res
city has been given to n
n n n n n n n n n n

QUININE.
1150

means of oil. And
Mr Gamme has
the whole of the
quinine in yellow bark can be extracted in a form undistinguishable,
either chemically or physically, from the best brands of European manu-
facture. This can be done so cheaply that, as long as the supply of bark
is kept up, quinine need never cost Government much above twenty five
rupees per pound. It is true that, at the present moment quinine is
obtainable in the open market at rates not very different from this, but
that is due to entirely exceptional causes. For some time back the
Ceylon planters have been uprooting their Cinchona trees both to save
them from disease and to make way for tea planting which appears now
to be becoming the principal industry of that Colony, and Cinchona
bark has actually been sold in London below the cost of its product on
in Ceylon. Indeed so far has
bark has been practically drive
matters which cannot continue

In the ordinary course, therefore, quinine might be expected soon to
The object of making
rise in the price of a

Method of extraction of the alkaloids from Cinchona bark by cold oil as
used at the Government Cinchona Factory in Sikkim

"In order that the oil may speedily and effectually act on the Cin-
chona bark, the latter is reduced to a very fine powder by means of Carter's
ness, it is passed
ed for sifting flour
six sided revolve-
is driven at the speed of about thirty revolutions to the minute. Any
particles of the powder which may be too coarse to pass through the silk
meshes drop out at the lower end of the revolving chamber and are again
pressed through the disintegrator

"2 A hundred parts of the finely powdered bark are then set aside to
be mixed with 8 parts of commercial caustic soda, 500 parts of water, and
600 parts of mixture composed of 1 part of fusel oil to 4 parts kero-
sine oil. If the caustic soda be of inferior quality, a little slaked lime

C 1150

CINCHONA

Government Cinchona Febrifuge and Quinine

QUININE.

(about 5 parts) may be used in addition to the 8 parts of caustic soda, or caustic soda may be altogether omitted and 15 parts of slaked lime may be used instead of it. The caustic soda is dissolved in the water and mixed with the bark. Then the oil is added and the whole is kept thoroughly intermixed in an agitating vessel. Should lime be used it is mixed in fine powder with the dry bark before adding the water and oil.

"3 The agitating vessels in use at Mungpoo are barrels with winged stirrers revolving in them vertically, and with taps on the sides for drawing off the fluids. The first stirring is carried on for four hours, and then the whole is allowed to rest quietly in order that the oil may separate out to the top of the watery fluid. When the oil which has now taken up the greater part of the alkaloids, has cleared out it is drawn off by a tap placed just above the junction of the two fluids. The oil is then transferred to another agitator, and is there thoroughly intermixed with acidulated water for five or ten minutes the mixture being again allowed to rest for the separation of the oil. It will now be found (if sufficient acid has been used and the stirring has been thorough) that the alkaloids have been removed from the oil to the acidulated liquor. The oil is again transferred to the bark mixture, and is kept intermixed with it for two or three hours, the oil is again drawn off in the same way, washed as before in the same acidulated liquor, and this process is repeated a third or a fourth time or until it is found, by testing a small quantity of the oil, that the bark has been thoroughly exhausted of its alkaloids. Each stirring subsequent to the second need not be continued for more than an hour. The quantity of acid required to take up the alkaloids from the oil will entirely depend on the quality of the bark operated on. If the bark contains 4 per cent of alkaloids, about 2lb of either sulphuric or muriatic acid mixed in twenty gallons of water should be sufficient and so on in proportion.

"4 The after-treatment of the acidulated water containing the alkaloids depends on the product desired and on the kind of acid that has been used. Should sulphate of quinine be desired and sulphuric acid have been used the liquor is filtered (if necessary), heated, and made neutral by adding a very weak solution of either caustic soda or liquor ammonia. It is then allowed to cool and as it cools the crystals form out. These crystals are afterwards separated from the mother liquor by draining through a cloth filter. After they have been thus obtained the crystals are dried. They are next dissolved in about fifty times the weight of boiling water. The resulting liquor is filtered hot through a little animal charcoal. On cooling after filtration the crystals again form out, and they are separated as before from the mother liquor by filtration through a cloth. The crystalline mass obtained by filtration is then placed in small lumps on sheets of white blotting paper stretched on slabs of plaster of Paris. By this means they are practically dried. They are afterwards thoroughly dried by being laid on blotting paper in a room heated to about 10 degrees above the temperature of the open air.

"5 If Cinchona febrifuge is wanted the alkaloids are exhausted from the oil by muriatic acid the solution being neutralized and filtered in the same way. On an excess of caustic soda solution being added the alkaloids are precipitated. After standing some hours the whole bulk of liquor and precipitate is passed through cloth filters, and when the alkaline liquor has drained off the precipitate is washed with a little plain water, dried, and powdered. The powder is Cinchona Febrifuge ready for use."

TRADE.
1151

TRADE IN CINCHONA

PRESENT CONDITION OF THE BARK TRADE.—Dr King has kindly furnished the following paragraph on this subject.—"The present condition

C. 1151

Foreign Trade in Cinchona.

CINCHONA.

TRADE.

of the Cinchona bark trade is one of depression. This is by no means due to any diminution of the demand for the Cinchona alkaloids, but in a great measure to the fact that an entirely new source of quinine has of late been discovered in the northern parts of South America. This

years been poured into the London market in enormous quantities under the designation of *Cuprea* bark. The depression is also greatly due to the enormous exports from Ceylon, where cinchona is everywhere being up-rooted to make way for Tea. The effect of these flushings has been temporarily to swamp the market, the *Cuprea* crushing out the more costly Cinchona barks. The Cinchona planter, however, has only (if he can afford it) to plant

bark goes on much become scarce in all must soon diminish increase of wealth in tropical countries, the consumption of quinine must steadily increase; at any rate, as long as malarious fevers continue to exist in these countries.

Remija plants have only recently been introduced into India. Plants are being grown in the Sikkim plantations, and Mr. Lawson alludes to those in the Nilgiri plantations as too young to advance any opinions regarding the success of this new undertaking. It seems probable, however, that it may be found possible to cultivate the *Cuprea*-bark plant in regions where labour may be less expensive than is the case with the Cinchona plantations. *Remija purdicana* and *R. pedunculata* yield the *Cuprea* bark of commerce.

In the official correspondence regarding Cinchona, various opinions have been given as to future prospects. Mr. J. E. Howard, in a letter addressed to the Secretary of State in 1872, remarked: "It remains that the planters should not over supply the demand of the world; this, indeed, is a possibility, but one so remote that it may be dismissed from all thought for at least the present generation, and the range of altitude above the sea level and the climate under which the Cinchona can be profitably grown are at best extremely limited, as Mr. Broughton's reports abundantly shew, and the plantations admitted that the abandoning of cinchona as a source of

more than fifteen years. An experienced Ceylon planter stated at a meeting of the Royal Pharmaceutical Society that the price now paid for bark had fallen so low that profit had become problematic.

INDIAN FOREIGN TRADE IN CINCHONA AND QUININE

The earliest notice of Indian-grown Cinchona bark in the London market occurs in 1867, but it was some years later before the bark assumed a commercial position. Ten years later, in the Review of Trade for 1875-76, Mr. J. E. O'Connor remarks "The total value of the imports of quinine in 1875-76 was £10,000. The removal of the import duty which, in the nine months of the year, it is manifest that as yet, even

shape of imported quinine and the alkaloids of Cinchona produced in India at the cost of the State, this valuable febrifuge can reach only a fraction of the population."

From 1883-84 to 1892-93, the value of the population increased, till in 1883-84, which date they were 12,038lb valued in the value of ports and last year 1,286,900lb valued at R. and value the exports are double what they were five years ago. These facts would seem to almost point to an opposite conclusion to that alluded to in the concluding sentence of the report, that the value of the population nearly doubled, of 1882-83. Making the

hoped, and indeed it has been somewhat invested in the business with expectation distant future. The fall in prices and the have restricted the trade; but though its

is satisfactory
febrifuge, the
In 1876-77 at
fact be placed
plantations, the immense benefit conferred on the people of India by the
Government's effort to provide the only trustworthy specific against the
malaria which carries off annually its thousands of the population. In a
note written for the Colonial and Indian Exhibition Catalogue Dr. King
says: "The
of rupee
ducts from
amounts
substituted
quinine worth to over twenty-five lakhs of rupees" (£250,000).
"The Government plantations on the
1885, 1,618,744 cinchona trees of various
of 1884-85 these plantations yielded a
results of the Nilgiri plantations since their commencement shows a net
surplus of profit of Rs. 51,743 (£55,174)"

CINNABAR.

Cinnabar is a sulphide of mercury, known in the vernacular as *Shingarf*. It is used in dyeing, but more for domestic use than by the professional dyer. It is said to be found in Central India and to be also produced artificially: it sells for Rs 40 a cwt.

See Mercury.

CINNAMOMUM

Tamala.

The Cassia Lignea

MEDICINE

closely in medicinal properties, for which they may be substituted. Baden Powell says that the leaves are considered by the natives hot and cardiac, and that they are useful in colic, indigestion, and nausea. The bark is prescribed by the hakims in debility of the stomach, enlargement of the spleen, affections of the nerves or heart, pains in the womb, also in retention of urine and catamenia, and bites of serpents and poisoning by opium. "An aromatic oil extracted from the fruit and leaves is used as a medicine" (*Bomb Gas*, LV., 66).

Special Opinions—§ "*Dalchini*, used in dispensary in place of true cinnamon; equally efficacious" (*Assistant Surgeon Nehal Singh, Saharunpore*). "The leaves in Kashmir, *Barg-i-Taj*, are employed as a substitute for *Chavica Bette, Reti*" (*Surgeon-Major J. E. T. Aitchison, Simla*). "Used with long-pepper and honey in coughs and colds, also in bronchitis and hay asthma" (*Brigade Surgeon J. H. Thornton, Monghyr*). "Given in decoction or powder in suppression of lochia after child birth, with much benefit" (*Surgeon-Major J. F. L. Ratton, Salem*). "Is used in coughs, flatulence, and fevers" (*Surgeon-Major D. R. Thomson, Madras*).

CHEMISTRY.

II90

Chemical Composition—"Cassia bark owes its aromatic properties to an essential oil, which, in a chemical point of view, agrees with that of Ceylon cinnamon. The flavour of cassia oil is somewhat less agreeable, and, as it exists in the less valuable sorts of cassia, decidedly different in aroma from that of cinnamon. We find the specific gravity of a Chinese cassia oil to be 1.066, and its rotatory power in a column of 50 mm long, only 01° to the right, differing consequently in this respect from that of cinnamon oil.

"Oil of cassia sometimes deposits a stearoptene, which when purified is a colourless, inodorous substance, crystallizing in shining, brittle prisms. We have never met with it.

"If thin sections of cassia bark are moistened with a dilute solution of perchloride of iron, the contents of the parenchymatous part of the whole tissue assume a dingy brown colour, in the outer layers the starch granules even are coloured. Tannic matter is consequently one of the chief constituents of the bark, the very cell walls are also imbued with it. A decoction of the bark is turned blackish green by a persalt of iron.

"If cassia bark (or Ceylon cinnamon) is exhausted by cold water, the clear liquid becomes turbid on addition of iodine, the same occurs if a concentrated solution of iodide of potassium is added. An abundant precipitate is produced by addition of iodine dissolved in the potassium salt. The colour of iodine then disappears. There is consequently a substance present which unites with iodine, and, in fact, if to a decoction of cassia or cinnamon the said solution of iodine is added, it strikes a bright blue coloration, due to starch. But the colour quickly disappears, and becomes permanent only after much of the test has been added. We have not ascertained the nature of the substance that thus modifies the action of iodine, it can hardly be tannic matter, as we have found the reaction to be the same when we used bark that had been previously repeatedly treated with spirit of wine and then several times with boiling ether.

"The mucilage contained in the gum-cells of the thinner quills of cassia is easily dissolved by cold water, and may be precipitated together with tannin by neutral acetate of lead, but not by alcohol. In the thicker barks it appears less soluble, merely swelling into a slimy jelly" (*Pharmacographia*, 531).

The leaves are known as *Teypat*, and the bark as *Taj*.

Food—The bark and the dried leaves are used to flavour dishes. It is much employed to adulterate true cinnamon.

FOOD
Bark
II91
Leaves
II92

The Cassia Lignea

CINNAMOMUM
Tamala.

Structure of the Wood—Reddish grey, splits and warps, moderately hard, close grained, slightly scented, not used Weight 39 lb per cubic foot

Introduction of Chinese Plant.—Dr King, in his report of the Botanic Gardens of Calcutta 1883-84, alludes to plants received from Hong-Kong any profit

TIMBER
1193

1194

FOREIGN TRADE OF CASSIA LIGNEA

TRADE.
1195

Year	IMPORTS		EXPORTS AND RE EXPORTS	
	Quantity	Value	Quantity	Value
	cwt	R	cwt	R
1880-81	19 660	4 68 576	4 487	1,18 248
1881-82	9 705	1 90 891	3 865	94 408
1882-83	13 240	2 61,543	2 211	45 921
1883-84	19 917	3 84 491	5 365	1 05 310
1884-85	14 769	2 48,344	4 692	81,394

Imports for 1884-85

Presidency to which imported	Quantity	Value	Country from which imported	Quantity	Value
	cwt	R		cwt	R
Bombay	12 308	2 01 944	Aden		
Bengal	2 226	41,460	China—Hong-Kong	13,537	2 24 805
Madras	235	4 940	Straits	1,212	23 536
TOTAL	14 769	2 48 344	TOTAL	14 769	2 48 344

Re-exports for 1884-85

Presidency from which exported	Quantity	Value	Country to which exported	Quantity	Value
	cwt	R		cwt	R
Bombay	4 675	81 114	Persia	2 785	49 8 6
Bengal	13	225	Arabia	980	17 051
Sindh	4	55	Turkey in Asia	715	11 955
			Other Countries	212	3 561
TOTAL	4 692	81,394	TOTAL	4 692	81 394

Dr Dymock (*Mat Med Ind, 2nd Ed, 667*) alludes to Cassia Lignea under the name C. Cassia. The trade is done in Bombay in the C. or Malabar Cassia is also large. The former he says, is sold at Rs for 37½ lb. In a farther page he alludes to C. Tamala, so that, apparently, the Malabar Cassia is according to Dr Dymock, different from C. Tamala. Definite information regarding the Indian trade in C. Tamala cannot be obtained but it seems probable very little if any of the truly Indian bark is exported.

CINNAMOMUM
zeylanicum

True Cinnamon

1196

Cinnamomum zeylanicum, *Brown*; *Fl. Br. Ind.*, V, 131; *Wight*,
True Cinnamon, [p. 112].

Syn.—*Laurus Cinnamomum*, *Willd.*; *Gay*, *Fl. Ind.*, Fl. C. R. C. 37.

Loxell, *Ed. Pr.*, 171, Bu
Romb. Ind., 71, 112, 2
Jamney, 106, 112, 107
Botany, 106, 112, 107
Ed. Pr., 171, Bu
Garten und Arboretum, 3

CAMPHOR.

1197

DYE

1198

Dye.—*Ceylon* is used, together, with myrobalan, chiefly
 West Provinces forests, and is used, together, with myrobalan, chiefly
 (Buck, *Dyes and Tans of*
 ge should be referred to

OIL.

1199

essential oil of cinnamon an
 obtained from this plant,
 Distillation is carried on
 The oil is of a golden-
 and aromatic,
 The leaves
 mes exported
 e third oil is
 in water, with
 but with a burn
 yield a brown,
 from Ceylon a
 obtained from the root, of yellow brown
 an odour of camphor and cinnamon, and a strong camphoraceous taste
 A fatty oil expressed from the fruit is also noticed by early writers, but it
 is at present unknown

of considerable firmness and solidity The quins of bark are
 somewhat
 extremely
 It has a
 bearing

C 1199

True Cinnamon.

CINNAMOMUM
zeylanicum.

here and there scars or holes at the points of insertion of leaves or twigs. The inner surface of the bark is of a darker hue. The bark is brittle and splintery, with a fragrant odour peculiar to itself and the allied barks of the same genus. Its taste is saccharine, pungent, and aromatic" (*Pharmacographia*, p. 525).

MEDICINE.
Bark.
I200

oil.
I201

oil of cloves. (*Pharm. Ind.*) "Cinnamon is largely used in compound prescriptions. A combination of cinnamon, cardamoms, and *tejapatra* leaves, passes by the name of *trijataka*, these three aromatics being often used together" (*U. C. Dutti*). As a powerful stimulant it is given in cramps of the stomach, toothache, and paralysis of the tongue (*Murray*). *Baden Powell* notices the use of cinnamon in low fever and vomiting, and also as an addition to purgatives to prevent griping. Cordial and astringent properties are also ascribed to it.

Special Opinions.—§ "Powdered cinnamon in 20-grain doses is a reputed medicine in dysentery" (*Assistant Surgeon T. N. Ghose, Meerut*). "Appears to be useful in certain forms of amenorrhœa when chewed or as Oil Cinnamon" (*Surgeon-Major G. J. Hunter, Karachi*). "The bark ground up with water into a paste is applied to the temples in neuralgia and severe headache" (*K. N. A. Dacca*). "Warm stomach cordial, carminative and astringent, useful in flatulence and diarrhœa. Cinnamon oil applied locally in very small quantity gives great relief in neuralgic headache" (*Surgeon C. M. Russell, M D, Sarun*).

England. It was prepared by *Valerius Cordus*, who stated, somewhat before 1544, that the oils of cinnamon and cloves belong to the small number of essential oils which are heavier than water, '*fundum petunt*'. About 1571 the essential oils of cinnamon, mace, cloves, pepper, nutmegs, and several others, were also distilled by *Guintherus* of Andernach, and again, about the year 1589, by *Porta*.

"In the latter part of the last century it used to be brought to Europe by the Dutch. During the five years from 1775 to 1779 inclusive, the average quantity annually disposed of at the sales of the Dutch East India Company was 176 ounces. The wholesale price in London between 1776 and 1782 was 21s per ounce, but from 1785 to 1789 the oil fetched 6s to 6s 6d, the increase in value being due to the increase in demand."

CINNAMOMUM
zeylanicum

True Cinnamon

CHEMISTRY.

r which we have not examined
hereby contaminated with resin

"Cinnamon contains sugar mannite starch mucilage, and tannic acid The *cinnamomum* of Marten (1863) has been shown by Wittstein to be very probably mere mannite The effect of iodine on a decoction of cinnamon will be noticed under the head of 'Cassia Lignea' Cinnamon afforded to Schützlar (1862) 5 per cent of ash consisting chiefly of the carbonates of calcium and potassium' (*Pharmacog.* 526)

Adulteration.—The authors of *Pharmacographia* remark that 'Cassia lignea being much cheaper than cinnamon is very commonly substituted for it So long as the bark is entire there is no difficulty in its recognition but if it should have been reduced to powder, the case is widely different We have found the following tests of some service when the spice to be examined is in powder Make a decoction of powdered cinnamon of known g of the suspected powder When each with one or two drops of tincture of iron is but little affected but in that of cassia a deep blue-black color is immediately formed' (*Pharmacog.* 526)

Food.—It is chiefly used in the preparation known as *pan* (pan-fry), also in curry, and enters into the preparation known as *pan*

FOOD
Bark
I203
TRADE
I204

FOREIGN TRADE OF CINNAMON

Year	IMPORTS		EXPORTS AND RE-EXPORTS	
	Quantity	Value	Quantity	Value
	lb	R	lb	R
1879-80	1 785	484	202	24
1880-81	7 707	3 511	19 432	4 833
1881-82	2 244	512	67 466	14 436
1882-83	18 731	3 641	27 768	11 068
1883-84	13 687	2 640	35 181	9 330

Detail of Imports, 1883-84

Province into which imported	Quantity	Value	Country whence imported	Quantity	Value
	lb	R		lb	R
Bengal	9 6	437	Straits Settlements Other Countries	11 924	2 034
Madras	12 547	2 143		1 763	606
British Burma	224	60			
TOTAL	13 687	2 640	TOTAL	13 687	2 640

C I204

False Pareira Brava.

CISSAMPELOS
Pareira

Detail of Exports, 1883-84

TRADE

Province from which exported	Quantity	Value	Country to which exported	Quantity	Value
	lb	R		lb	R
Bengal	4,032	860	United Kingdom	30,334	8,328
Bombay	745	122	Mauritius	3,472	690
Madras	30,434	8,348	Other Countries	1,375	312
TOTAL	35,181	9,330	TOTAL	35,181	9,330

CISSAMPELOS, Linn.; Gen Pl, I, 37, 962.

1205

Cissampelos Pareira, Linn, Fl Br Ind, I, 103, MENISPERMACEÆ

FALSE PAREIRA BRAVA.

Syn — C. HERNANDIFOLIA, Wall, Cat, 49, 79, partly, Roxb, Fl Ind, Ed C B C, 742

Vern — Akanádi, dakh nirbisi, pári, karyeuri, HIND Akanádi, nemuko, BENO, Tejo malla, SANTAL, Batulpoti, NEPAL, Katori, tikri, parbh, palaki, ba' bel, sakhi hayat, sucum zeat, batinda páth (leaves), pilayari, pilayur, and katori (root), PB, Katori (root), belpath (leaves), SING, Nirbisi (root), DUK, Venueel, BOMB, Parayel, GOA, Pomushtie, pun mashtie, vata tirupie, TAM, Pata, TEL, Ambashthas patha, SANS, Dryamitta, weni wala, SING

Referoces — Brandis, For Fl, 10, 571 Gamble, Man Timb, 11

Habitat — A lofty climber, common both to the Old and New Worlds. In India it is met with in the tropical and subtropical provinces from the coast to the interior, ascending in the hotter regions to the hills. Common below Simla at that altitude. The true drug is, however, derived from *Chondodendron tomentosum*, Ruiz et Pav, growing in Peru and Brazil. *Cissampelos Pareira* was, for a long time, believed to have been the same as the true drug.

Description of the Drug — "The drug is drical, oval, or compressed piece, 1/2 inch to four inches in length. Bark greyish, crossed transversely by annular elevations, grey, porous, with well-marked, often incomplete, concentric rings and medullary rays. Taste at first sweetish and aromatic, afterwards intensely bitter" (Pharm Ind).

In distinguishing the true from the false drug, the following facts have to be borne in mind. "In the root of *Chondodendron* there is a large well-marked central column composed of wedges diverging from a common axis, round which are arranged a few concentric rings intersected by

MEDICINE
Root
1206

C 1206

CITRULLUS
Colocynthis.

False Pareira Brava; Colocynth.

MEDICINE.

Root.
1207
Bark.
1208
Leaves
1209

wedge-shaped rays, which are often irregular, scattered, and indistinct. The axis is not often eccentric. In *Cissampelos Pareira* the root and stem are nearly alike in structure, and in transverse section there are concentric rings." "(*Year-Book of Pharm.*, 1873, 30.)

Medicine.—The dried ROOT and BARK are used as mild tonics and diuretics in advanced stages of acute and chronic cystitis and catarrhal affections of the bladder; also exercises apparently an astringent and sedative action on the mucous membranes of the genito-urinary organs. They are generally administered in the form of decoction and extract. The leaves are applied to abscess. *Alnallie* writes: "The leaves of this plant are considered by the *vyliant* as of a peculiarly cooling quality, but the root is the part the most esteemed; it has an agreeable, bitterish taste, and is considered as a valuable stomachic. It is frequently prescribed in the latter stages of bowel complaints, in conjunction with aromatics. *Cissampelos Pareira* has been very highly extolled by several writers for its medical virtues, particularly by *Sloane*, *Marcgraaf*, *Barham*, and *Wright*. The first speaks of the efficacy of the leaves as a vulnerary for

"... in the
Barham,
sentence
es on con-
y a syrup

CHEMISTRY.
1210

a yellow bitter principle, a brown colouring matter, starch, an acidulated substance, and various salts of ammonia and lime" (*O'Shaughnessy*). *Wiggers* discovered in this root the substance *pelosina*, which exists to the extent of about $\frac{1}{2}$ per cent.

§ "Contains a bitter principle, *Buxine*, which, according to *Fluckiger*, is probably identical with *Berberine*" (*Surgeon C. F. H. Warden*, Professor of Chemistry, Calcutta).

Cissus carnosa, Lam., see *Vitis carnosa*, Wall, ANPELIDÆ.

C. discolor, Blume, see *V. discolor*, Dals.

C. edulis, Dals., see *V. quadrangularis*, Wall.

C. pedata, Lamk., see *V. pedata*, Vahl.

CITRULLUS, *Schrad.*; *Gen. Pl.*, I., 826.

1211

Citrullus Colocynthis, *Schrad.*; *Fl. Br. Ind.*, II., 620; *Wight*, *lc.*, t. 498; *CUCURBITACEÆ*.

COLOCYNTH, *Eng.*

C. 1211

CITRUS.

The Genus Citrus.

Risso, as a synonym under *C. nobilis*, *Lour.* (the Mandarin)—a species which he regards as quite distinct from *C. Medica*, *Linn*

The specific distinctions in *Citrus* are based chiefly upon the degree to which the petiole is winged, on the colour of the flower (pinkish-white in the lemons and pure white in the oranges), and on the shape of the fruit, pear-shaped and more or less mamillate in the lemons and globular and non-mamillate in the oranges. Species characterised by the degree of development of a certain feature must naturally under cultivation become hopelessly intermixed, hybridisation rendering it almost impossible to distinguish the forms. This is true in its fullest extent with the members of the genus *Citrus*, and it is by no means an easy task to say in what respects an orange differs from a lemon. The extreme forms are readily enough recognised, but these break down when a large collection is examined side by side. The writer, however, is disposed to agree with Kurz that there is no advantage gained by combining the Sweet Lime (*C. Limetta*, *Risso*) with the Sweet Lemon (*C. Medica*, var *Lumia*, *Risso*). It would seem desirable to accept Roxburgh's position, and to place the majority of the forms described by him under *C. acida*, *Roxb.*, along with *C. Limetta*, *Risso*, but apart altogether from *C. Medica*. The writer would even go further and view the lemons as having by no means so distinct a claim as the limes to be regarded of Indian origin. The limes appear intermediate in character between *C. Medica* and *C. Aurantium*, having the rounded fruit, white flowers and winged petioles of *C. Aurantium*, with the flavour, chemical properties, and peculiar character of the rind of *C. Medica*. Whether Kurz be correct in viewing the sweet lime of India as but a form of *C. nobilis*,—the Mandarin of China,—may be doubted, but these are certainly allied plants, and to this group should be added *C. Hystrix*, the three species being separated from *C. Medica* and *C. Aurantium* by their very much smaller flowers. It is usual to regard the small round, dark orange-red fruits sold at hill stations as Mandarins, and DeCandolle states that Mr O. B. Clarke is of opinion that the cultivation of the Mandarin is extending on the Khasia hills. Dr Bonavia appears to doubt the existence of the Mandarin in the Khasia hills but recommends its introduction. That author speaks of good Mandarins as occurring in Ceylon, but is unaware of any in India. The true Mandarin, in the opinion of most writers, does occur in India, but it would be interesting to have the question of its relation to the sweet lime more clearly established. According to Kurz, these two cultivated plants are one and the same species, *C. nobilis*, being much cultivated all over Burma. This conclusion may not, however, be regarded as satisfactory, from the fact that the Mandarin is chiefly characterised by the extreme thinness of the rind and deliciously flavoured pulp, whereas in the sweet lime the rind is coarse or even thick, and the pulp much inferior to that of the Mandarin. Dr Rice regards the Mandarin or Maltese orange as a variety of *C. Aurantium*, *C. Hystrix* is the characteristic wild species of Burma.

Having now indicated very briefly the present position of this subject, and the probable changes which may be effected in the grouping of the known forms, it will not be necessary, for the purposes of the present publication, to depart materially from the altitude taken by the authors of the *Flora of British India*. The following analysis drawn from that work, with one or two additions from Kurz's *Forest Flora of Burma* (published subsequently), may be found useful —

* Young shoots and leaves perfectly glabrous, transverse vesicles of the pulp concrete

† A shrub, young shoots purple, petiole more or less naked, petals generally tinged with red, flowers

The Sweet Orange

CITRUS
Aurantium.

- often unisexual, stamens 20-40, style long, thick, fruit globose, ovoid or oblong, often mamillate, rind very thick and rough 1 C. Medica.
- †† A tree 15 to 25 feet in height, petiole short winged, flowers small, white, usually solitary, style long, thick, fruit globose or somewhat oblong, not mamillate, rind very thin, nearly smooth, shining, yellow or orange coloured 2 C nobilis (and P C. Limetta)
- NOTE.—If C. Limetta be added as a synonym of C nobilis the definition of the rind would have to be modified
- ††† A small shrub, leaflet smaller than the broadly winged petiole, flowers as in C nobilis, only pedicellate and clustered in the axils of the leaves, style very short, fruit globose or ovoid, a little larger than the size of a walnut, rind thick, yellow C. Hystrix
- ††† A tree, young shoots whitish, petals more than twice the length of those in the two preceding species, flowers bisexual, stamens 20-30, style long, thick, fruit globose or flattened, pulp sweet, acid or bitter C. Aurantium.
- ** Young shoots and under-surface of the leaves pubescent, transverse vesicles of the pulp distinct C decumans

value

Citrus Aurantium, Linn (in part), Fl Br. Ind, I, 515, Rutaceæ

1232

The name *Aurantium* is not derived from the Latin *Aurum* "gold," but comes to us from the Arabic *narandj*. This became *narendj* (*narang*) in the Persian and its equivalent in Sanskrit is *nagaranga*, and in Hindustani *narangi*. Names beginning with *nar* are generally associated with fragrance. The name for the orange first reached Europe through the Moors, and became *naranga* in Spanish *laranga* in Portuguese,

Arancio

wards a

as also

bitter o

orange

The English word orange is derived from the same root (Rice,

DeCandolle, Jule Burnell, &c)

Var 1. Aurantium proper (var β dulcis, Linn) (For var 2, see p 345)

Botanical Diagnosis.—Petiole naked or winged, pulp sweet, yellow,

very rarely red, rind loose or adhering

THE SWEET ORANGE, CHINA ORANGE, PORTUGAL ORANGE, Eng, ORANGER, Fr, ARANCIO DOLCE, PORTOGALLO, MELARANCIO, It, NARANJO, Sp, LARANJEIRA DE FRUCTO DOLCE Port, APFELSINE, SUSSER POMERANZENBAUM, ORANGENBAUM, Germ, PORTOGALLO, Gr, LARANJAS, Rus

Var 1st
Aurantium.
1233

C. 1233

The Sweet Orange.

CITRUS
Aurantium

HISTORY.

date just given, but of inferior quality, so as not to attract the attention
 more
 with
 to it
 reeks
 and
 the
 ether
 ze to

that the orange is a native of China; the names given to the various
 forms are represented by a particular character which occurs in the most
 ancient Chinese writings, whereas the names given to the pumelo and
 the lime are of a much more modern character.

Cintra—a town famous for its fruits. Yule-Burnell say: "As early
 as the beginning of the fourteenth century we find Abulfeda extolling the
 fruit of Cintra. His words, as rendered by M. Re naud, run: 'Au
 nombre des dependances de Lisbonne est la ville de Schintara; à Schin-
 tara on recueille des pommes admirables pour la grosseur et la gout.'"

be doubt-
 mperor of
 which is,
 the fruit,
 would ac-
 but for the
 is adhered

to the fruit in question" Numerous passages might be quoted in sup-
 port of this: "The *Sengtereh* is another fruit

in
 the citron (*Táranj*), but the skin of
 6), *Memoirs*, page 328). Kirkpatrick, in
 eaks of the Nepaul *Santola* orange as
 which, he says, "I take to be a corrup-

CITRUS

Aurantium.

The Sweet Orange.

HISTORY.

tion of *Santalum*, the name by which it is in the species of orange is known in the Upper Provinces."

The sweet and the bitter cultivated oranges are, by some writers (among whom are the learned authors of the *Indica*) stated to be derived from the same stock. The *Indica* is the native country of the orange.

"The belief (well very) support the opinions published in Dr. Bonavia's paper alluded to above. Referring to the small and known over the North-West the orange is called *Santalum* of natural orange. The *Indica* Mr. J. H. Fisher, the Rajah of Kulabandi (a Province) brought him orange trees, which grew

certain places in the *Indica*. Mr. Fisher adds, however, that as he was unable to visit the locality he "never had an opportunity of seeing these wild trees." Both the last mentioned writers appear to be of the opinion that it would be unsafe to infer, even from the

of the pine-apple, many a hasty inference that a writer to the Sanskrit writers and bitter oranges but not writers

CULTIVATION

CULTIVATION OF ORANGES IN INDIA.—There are two great centres of sweet orange cultivation in India—the eastern side and Nagpur in the west and the

Darjeeling and oranges of Ceylon
Dr Bonavia refers the sweet oranges to four cultivated races, two of which should most probably be referred to *C. nobilis*, namely, the Mandarin and the blood red Maltese like orange found at Gujranwala. The Maltese orange proper has recently been introduced into India, and is being cultivated at Jounpore and other localities. From an industrial

The Sweet Orange.

CITRUS
Aurantum.

or economic point of view, it is of little consequence whether, a sweet orange be referable to *C. Aurantium* or *C. nobilis*; we may therefore follow Dr. Bonavia, since that authority has very strikingly exemplified the manner in which continental India might have a continuous supply

CULTIVA-
TIONTHE RACES
OF SWEET
ORANGES.

Race 1st,
Santara.
1234

ber, December, and January.

Vern.—The following are the special vernacular names mentioned for this form

Brao ;

Kompho

tenga,

latter i

two ero

and tho

an afte

rungira

Drum

Poona; Athli, MAO; Konda ngrun, SING

Mr. Morris (in his Godavery District, Madras Presidency) says: "a

but it is

entirely

ant fact,

the word *Armala* being thus claimed as both a Bengali and a Telugu word. Dr. Bonavia says that in Assam the word *Kamala* is believed

note the Editor of

ome from Kumilla,

rese derivations is

this loose-skinned

orange of the central tracts of India came from Assam, and carried its name with it. The plant could scarcely have been indigenous to both

he same name in two languages.

far it is correct to throw all the above

nge, for example, has a thick rind

and is very spongy, more so than either the Khásia or Nagpúr orange. The orange with a thick rind, met with in the Godavery District, Mr Morris informs us, was introduced by the Dutch, and to this day bears

Race 2nd,
Keonla

1235

darker colour, thinner, and adhesive (e.g. jacket not loose). This is the orange that comes latest into the Calcutta market. It is plucked about January and February. The Keonla orange is, perhaps, more extensively diffused over India than the Santara. It can stand a greater amount of heat and is therefore the orange of the isolated and private orchards over the greater part of the country. It is never so sweet as the Santara orange, but its bitter sweet flavour is perhaps all the more grateful at the season of the year at which it is available.

Vernacular names in the various provinces of India for this peculiar form are not available.

CITRUS
Aurantium.

The Sweet Orange.

RACES OF
SWEET
ORANGES.

Before proceeding to discuss the third class of sweet oranges referred to by Dr. Bonavia it may be as well to refer to another author. Mr. Atkinson says of Kumona: "The sweet orange is the form most usually cultivated, and there are several local varieties, some named after the localities in which they are produced, and others according to specific local distinctions in size and flavour. The three most common varieties cultivated in the plains are the *Santar*, *Narang*, and *Kanula* or *Kumli*. The last is the smallest and most esteemed." The writer feels strongly inclined to suspect that *Kanula*, *Kumli*, *Kanula*, and even *Kamali* are names derived from a common source, and that the oranges they represent should be isolated from those designated *Santar* or some derivative from

...doubts may be entertained with any other
...it is a coincidence not
...unmistakably indigenous cultivated plant, that names so much alike as
those given above, should occur in the most remote parts of India
and be used by peoples as distinct anthropologically as they well
could be. It may be further suggested that the thick skinned oranges
may be found to correspond to Mr. Atkinson's second class *Narang*.
This writer concludes his account of the Himalayan oranges as follows:
"The orange has been found
petioles at Bigewar in Kum.
and with globose fruits, naked
late, renunciate leaves in Garhi
possible to avoid the conviction that too strong opinions have, by all
writers, been advanced as to the Himalayan home of the sweet and bitter

Race 3rd,
Malta-
1236

coarse thick adhesive rind, is common
in both cases possessing a peculiar and distinctive odour which it once
isolates these forms from the oranges already described. They come
into season after the
were an effort to be
of the blood red for
Dr Bonavia,
the cultivation
of oranges in

The Sweet Orange

CITRUS
Aurantium.RACES OF
SWEET
ORANGES

1237

the hot season the time when these fruits would be most acceptable. Speaking of the Gujranwala oranges Dr Bonavia says Colonel Clarke introduced these from Malta in 1852—56 Dr Bonavia himself introduced the same orange into Lucknow in 1863, and Mr O Nickels established the Jounpore stock in 1872 Prior to the Mutiny blood oranges were grown in Lucknow, so that there must have been earlier introductions than those mentioned above From these centres, however, the cultivation of the red oranges has been greatly extended, so that they are now met with in most districts in Upper India At Poona a blood orange is common, and in some parts of India, Dr Bonavia very naturally arrives at the conclusion that the better qualities of red oranges must be modern introductions

Speaking of the blood oranges of Gujranwala, Dr Bonavia says "the specimens of blood oranges sent to me by Mr Steel, Deputy Commissioner of Gujranwala, in my opinion, are the *best oranges* that I have tasted in India The pulp is of the orange claret colour Many of the specimens were full blooded, and smeared externally with a blood tinge The juice was simply nectar like In short, their flavour was, in my opinion, simply perfect I thought them equal to that of the blood oranges of Malta." "Mr Steel states that the soil on which they grow is a stiff clay with plenty of *kankar* in it. But the real secret, he thinks, is

account Here there is a chance of creating an extensive trade in blood oranges, as a speciality of Gujranwala They are not only exquisite oranges, which if, properly packed, would bear long journeys, but they are *late* oranges, and therefore would not be in the market until the

"March Last year, some by careful July"

writers
ly met
he true
, which

Race 4th
Mandarin
1238

used by most writers the special Chinese development from the same stock as the Maltese orange In a further page particulars will be found regarding this orange, suffice it in this place to add that in Dr Bonavia's opinion the true Mandarin, while found in Ceylon does not exist in India Mr O B Clarke, on the other hand says the cultivation of this form is rapidly extending in the Khasia hills Dr Bonavia recommends its introduction in the highlands of Bengal "where it would be out of the influence of the hot winds," which have killed or rendered useless all the plants grown in Upper India

Having now briefly indicated the chief forms of sweet oranges met with in India, the present article may be completed by giving some idea of the orange industry at the two great commercial centres—Silhet and Nagpur

I—ORANGES OF SILHET AND NAGPUR
proper appeared on this sub
Society of India, from the per

Silhet
1239

The Sweet Oranges of Silhet.

CITRUS
Aurantium.

"It will be observed that this is a very siliceous soil, proceeding from the decomposition of siliceous rocks alone. It contains no carbonate of lime and is a very open and porous soil."

CULTIVATION—The seed is sown in January and February, thickly in troughs or boxes in about 6 inches of soil. These seed-boxes are raised above the height pigs could reach them, and are often protected by nets from rats and squirrels. The seedlings are pricked out during the ensuing rains; but in doing so the boxes are broken up and the earth shaken away from the roots, so that there is absolutely no injury done to the tap-root. They are transplanted into a nursery in the grove; here they are weeded, &c., and the time to be spent

ORANGE PRO-
DUCTION IN
INDIA.Cultivation.
1240

COLLECTION AND PRUNING—Each collector has a ladder, about 20 feet long, made of light bamboo. A coarse net bag, held open at the mouth by a cane ring, depends on his back by a strap passed over the right shoulder and chest. Into this he throws the oranges and before descending he removes the withered leaves and dead branches, or cuts out boughs injured by the loranthus parasite that does such damage to the plants. "The orange trees receive no other handling than the above; they are never systematically pruned or thinned, and are allowed to retain just what fruit they set, and yet the crop turns out wanting neither in size, flavour, nor abundance. Contrast with this the elaborate summer and winter pruning of the French gardens and the systematic cultivation and manuring of the Genoese, and yet with all their labour they produce a fruit inferior in quality and beyond all measure dearer in price than that produced by the comparatively thriftless and indolent Khásia." Boys are employed with pellet bows to keep off the crows, squirrels, monkeys, horn-bills, and other animals destructive to the crop. All the fruit which falls to the ground by wind or otherwise is gathered "every morning, peeled and given to pigs and dogs, and it is not a little remarkable to see how the dogs have come by habit to relish" this food.

Collection and
Pruning.
1241

TRANSPORT TO THE PLAINS—The oranges so collected are taken down the river in long canoes or dug-outs and sold at Chuttuck. They are counted in fours, 750 (a remnant of the old system), and the delicate finer qualities with this. . . . not found to endure the rough . . . mentions that at Phallik Bazar, . . . tly inferior quality are sold by bartering for rice, fish, &c., to the Muhammadan boatmen at Rs 3.00, being Rs 4 less than the oranges at the Shalla groves, and yet this includes the cost of cultivation, labour of plucking, and carriage to the river.

Transport
1242

TRADE IN SILHET ORANGES.

Mr. G. Stevenson, Deputy Commissioner, Silhet, has furnished the following tabular statement—

					BOAT TRAFFIC	
					Quantity in maunds	Value in Rs
1886-87	.	.	.	.	1,00,378	2,40,000
1887-88	.	.	.	.	1,00,000	2,40,000
1888-89	.	.	.	.	1,00,000	2,40,000
1889-90	.	.	.	.	1,00,000	2,40,000
1890-91	.	.	.	.	1,00,000	2,40,000

TRADE
1243

CITRUS
Aurantium.

The Sweet Oranges of Silhet.

ORANGE PRO-
DUCTION IN
INDIA.Series, 1869, of
the "Orange

new localities

the collection

Soil.

precludes the reproduction of the entire paper, and the reader who may be specially interested in this subject is therefore referred to the original; the following abstracts, however, may be found useful:—

Soil.—Mr. Brownlow shows that the prevalence of water below the roots is a feature evidently favourable to orange cultivation, although this water must not be stagnant. The peculiar underlying pebbly stratum is such that the water percolates from the river below the orange groves and

quence left uncultivated. Here, in one large connected piece of perhaps 1,000 acres, is the garden that supplies a great part of eastern as well as western Bengal with oranges; I say perhaps 1,000 acres, because the area under cultivation is not known to the Khásia proprietors themselves." "One may walk for a good hour or two, always under the shade of orange

find here." The climate and soil, in Mr. Brownlow's opinion, is that eminently suited to orange cultivation, and we may therefore reproduce Dr. Waldie's analysis of the soil, collected for that purpose by Mr. Brownlow, from the Shalla plantations.

"Of the sample received 100 parts dried at 212°F. = 97.27 or 102.8 as received equal to dry 100.

Soil dried at 212°F.

Alumina	6.09
Peroxide of iron	4.93
Lime	.19
Magnesia	.13
Alkalies (by difference and loss)	.80
Silica solution	.15
There is also a little	12.29
	3.49
	5.66
	78.56
	100

CITRUS
Aurantium.

The Sweet Oranges of Nagpur.

TRADE.

Dr. Bonavia, comments -
about 1,21,095 maunds of
of rupees, in favourable year
to be equal to about 8,05
Bonavia further adds: "
small Taking 8,05,360 to
low, the figures would be 2,41,60,800, or about 210 oranges to the
maund."

Nagpur.
1244

II.—ORANGES OF NAGPUR IN THE CENTRAL PROVINCES.—We have already given several passages that refer to the so-called wild oranges both of Nepal and the Central Provinces. It will only be necessary further to give here a brief account from the pen of Mr. J. B. Fuller, as published by Dr. Bonavia, in order to place before the reader a comparative sketch of these groves to complete what has been said of the Khásia hills. These two localities represent the bulk of the orange production of India. Mr. Fuller says:—"Within the last twelve years many new orchards have been planted in Nagpur, Kamptee, and other parts of the district, and orange cultivation is now spreading rapidly in other districts of the Province. There is a great demand for the Nagpur oranges in Bombay, and considerable quantities of the fruit are annually exported to this and other places. In the year 1885, 22,609 maunds of orange fruit were exported from Nagpur station, out of which 21,400 maunds were exported to Bombay alone."

It is perhaps only necessary here to repeat that the North-West Provinces receive their supplies from Nepal, Delhi, and to some extent also from Nagpur. Panjáb, Madras, and Burma are practically dependent on local production from isolated orchards, Madras drawing largely from the Shevroys.

Properties and Uses—

Gum.—The orange tree is said to yield a gum of no importance. A sample was sent from Masulipatam to be shown at the Madras Exhibition in 1855.

MEDICINE
Rind.
1246

India treats the sweet and bitter
dried outer portion of the rind of

"The Muhammadan writers describe the best kind of oranges as large, thin-skinned, dry, the juice when set with sugar, rhæa, &c. checking the blood."

Oranges are considered to be alexipharmic and disinfectant; orange-water stimulating and refreshing. The essence is extracted by oil from the rind and flowers, and is used as a stimulating liniment." (*Dr. Dyckhoff, Mat. Med. W. Ind.*)

Ainslie makes the following remarks: "Oranges are in great repute amongst the Hindú physicians, who suppose that they purify the blood,

C. 1246

The Bitter or Seville Orange.

CITRUS
Aurantium.

allay thirst in fevers, cure catarrh, and improve the appetite. A sherbet made in Inclemor of orange rind pulverised and added to magnesia and rhubarb affords a grateful tonic to the stomach in gout and dyspepsia. The roasted pulp is an

MEDICINE.

with eczema on the face of a "badgered" (Sanskrit) person.

Food.—
butted over
market.

FOOD.
1247

grown in and about Delhi is on the average larger, but more spongy,

orange tree, at the convent of St. Sabina at Rome, dates from the year 1200. The produce of one tree ranges from 500 to 6,000 fruits a year, and the tree sometimes grows to a height of 50 feet, with a trunk 12 feet in circumference.

Structure of the Wood.—Yellowish white, moderately hard, close and even-grained.

TIMBER.
1248

Var. 2. Bigaradia, *Fl. Br. Ind.*, I., 515. (For var. 1st, see p. 335 and for 3rd, p. 347.)

Botanical Diagnosis.—Petiole short-winged; flowers large, strongly scented; rind very aromatic, pulp bitter.

Var. 2.
Bigaradia.
1249

THE BITTER OR SEVILLE ORANGE; BIGARADIER, *Fr.*; ARANCIO FORTE, *It.*; POMERANZE, *Ger.*

Syn.—*C. VULGARIS*, *Risso*, *C. BUXIFOLIA*, *Poir.*

Habitat.—The bitter orange is very extensively grown in the warmer parts of the Mediterranean, especially in Spain and Malta. In India it does not seem to be cultivated except in gardens, but it is believed by the natives of the Himalaya from Garhwal to be native to that area, extending almost entirely from

Marmalade is chiefly made from the rind of this species, but it is doubtful whether Indian-made marmalade is made from the Seville orange, or simply from oranges. The form known as *k* is used as a stock for the better qualities of imported bitter oranges. Definite information cannot be obtained as to the extent the Seville orange is being cultivated in India.

Marmalade
1250

OIL OF NEROLI.

Oil and Perfumery.—Essential oils are obtained from most of the species of the *Citrus* family. Sir W. O'Shaughnessy, speaking of the sweet

OIL
1251

C. 1251

CITRUS
Aurantium

The Bitter or Seville Orange

PERFUMERY

1252

oranges, says that "the leaves are rather bitter and contain essential oil. A still more fragrant oil, called oil of *neroli* by the perfumers, is afforded by the flowers." Plesse, in his work on Perfumery, describes *neroli* oil, and says that the best quality is obtained by distillation, with water, from the flowers of *Citrus Aurantium* (the sweet variety). According to the same author, an inferior quality of *neroli* is derived from the blossoms of *Citrus Bigaradia* (the bitter variety). This oil is called *Essence de Néroli Bigarade*, and the oil from the flowers of the sweet variety bears the name of *Essence de Néroli Pétales* or *Néroli Louce*. This statement is opposed, however, to the opinion given by almost every other writer, the *neroli otto* from the sweet orange being used only as an adulterant to that from the bitter. The fresh flowers of the *Bigaradia* orange yield on distillation *Essence de Néroli Bigarade* and if the sepals are carefully removed from the flowers the essence is known as *Essence de Néroli Pétales*. The latter is finer and much more expensive than the former. From the seeds *Essence de Petit Grain* used to be manufactured, but this is now entirely distilled from the leaves and twigs. It is therefore a misnomer to call it *Essence de Petit Grain*. Similar essences are distilled from the leaves of most species of *Citrus*, and these are all used together with essential oil of orange leaf to adulterate *neroli otto*. The water which passes over with the oil during distillation constitutes, when separated from the oil, *Orange-flower Water* (see below).

1253

The extraction of *Neroli* oil is chiefly carried on at Grasse, Cannes, and Nice, in South France also in Algeria. In France, about 20,000 ewt of the flowers are annually distilled. The sweet variety yields but half the amount of oil which may be obtained from the bitter, as much as 0.6 per cent being often obtained. The oil of *neroli* is commonly adulterated with *bergamot* and *petit grain*. According to Flückiger, the *neroli* commonly sold contains $\frac{2}{3}$ ths *Essence de petit grain*, $\frac{1}{3}$ th essence of *bergamot*, and $\frac{1}{3}$ ths of true *neroli*.

Fine *neroli* oil is brownish, of most fragrant odour, and bitterish aromatic flavour, specific gravity, at 11° C, being 0.889. It is neutral to test paper. When mixed with alcohol it displays a bright violet fluorescence quite distinct from the blue fluorescence of a solution of quinine.

Neroli Camphor.—The authors of the *Pharmacographia* obtained by distillation from the oil a very small amount of camphor called *Neroli Camphor*, and they state that they were unable to obtain any similar substance from the oils of *bergamot*, *petit grain*, or orange peel.

Uses of Neroli Oil.—Oil of *neroli* is employed almost exclusively in perfumery. The "petite" and the "bigarade" *neroli* are used to an enormous extent in the manufacture of Hungarian water and Eau de Cologne and other handkerchief perfumes. The "*petit grain*" is mainly consumed for scenting soap.

OTHER PERFUMES.—The flowers by infusion in a fatty body make an admirable pomatum, the strength and quality varying according to the number of infusions of the flowers made in the same grease. By digesting orange flower pomatum in rectified spirits in the proportion of from six pounds to eight pounds of pomade to a gallon of spirit for about a month, the *extrait de fleur d'orange* is obtained, a handkerchief perfume surpassed by no other scent. In this state its odour resembles that of the fresh flowers so much that with closed eyes the best judge could not distinguish the scent of the extract from that of the fresh flowers. (Plesse.)

ORANGE FLOWER WATER.—This is an important article of manufacture, among the distillers of essential oils. It is largely used in pharmacy. "There are three sorts of orange-flower waters found in commerce. The first is distilled from the flowers, the second is made with distilled water

Neroli Camphor
1254Eau de Cologne
1255

1256

1257

CITRUS
Aurantium.

The Bitter or Seville Orange.

PERFUMERY.

oranges, says that "the leaves are rather bitter and contain essential oil. A still more fragrant oil, called oil of neroli by the perfumers, is afforded by the flowers." Plesse, in his work on Perfumery, describes neroli oil, and says that the best quality the flowers of Citrus Aurantifolia same author, an inferior quality Citrus Bigaradia (the bitter or Bigarade, and the oil from the flowers of the sweet variety bears the name of Essence de Neroli Petale or Neroli Lence. This statement is opposed, however, to the opinion given by almost every other writer, the neroli oil from the sweet orange being used only as an adulterant to that from the bitter. The fresh flowers of the Bigaradia orange yield on distillation Essence de Petit Grain. The seeds are removed from the The latter is fit the seeds Essence de Petit Grain used to be manufactured, but this is now entirely distilled from the leaves and twigs: it is therefore a misnomer to call it Essence de Petit Grain. Similar essences are distilled from the leaves of most species of orange leaf to the oil during flower water (see below)

1252

1253

The extraction of Neroli oil is chiefly carried on at Grasse, Cannes, and Nice, in South France, also in Algeria. In France, about 20,000 cwt. of the flowers are annually distilled. The sweet variety yields but half the amount of oil which may be obtained from the bitter, as much as 0.6 per cent being often obtained. The oil of neroli is commonly adulterated with bergamot and petit grain. According to Flückiger, the neroli commonly sold contains 1/3th Essence de petit grain, 2/3th essence of true neroli.

" bitterish aromatic
" utral to test paper.
" fluorescence quite
" ne
" phia obtained by
" alled Neroli Cum.
" similar substance

Neroli Camphor.
1254

from the oils of
Uses of Neroli Oil.—Oil of neroli is employed almost exclusively in perfumery. The "petale" and the "bigarade" neroli are used to an enormous extent in the manufacture of Hungary water and Eau de Cologne and other handkerchief perfumes. The "petit grain" is mainly consumed for scenting soap.

Eau de Cologne
1255

1256

" body make an ad-
" the num-
" digesting
" f from six
" for about a month,
" kerchief perfume sur-
" embles that of the fresh
" distinguish
")
" manufacture,
" pharmacy.

1257

"There are three sorts of orange-flower waters found in commerce. The first is distilled from the flowers, the second is made with distilled water

The Bergamot Orange.

CITRUS
Aurantium.

PERFUMERY.

and neroli, and the third is distilled from the leaves, the stems, and the young unripe fruit of the orange tree." (*Piesse*) "As met with in commerce, orange-water is colourless or of a faintly greenish-yellow tinge, almost perfectly transparent, with a delicious odour and a bitter taste." (*Pharmacog*)

ESSENTIAL OIL OF ORANGE
also the south of France
process, partly from the E
tugal Orange, the scarcely ripe fruit being in either case employed The
oil made from the former is much more valuable than that obtained from
the latter, and the two are distinguished in price-currents as *Essence de*
Bigarade and *Essence de Portugal*.

"These essences are but little consumed in England, in liqueur-making and in perfumery." (*Pharmacog*)

Var 3. Bergamia, *Fl Br Ind*, I, 515

Var. 3
Bergamia
1258

THE BERGAMOT ORANGE

Syn.—C AURANTIUM, var BERGAMIA, IV & A Prodr, 98; C LIM.

Ve

Lamya-st, or tam buyu-st, BURM

References.—*P*, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

Habitat.—The Bergamot Orange is cultivated near Reggio in South Calabria, in Sicily, and in the south of France; but it is only rarely met with in India. It may be doubted how far the above vernacular names given to it are correct. The fruit, when full grown, is still unripe and green, they are sometimes known as green oranges. Some of the green oranges met with in India (and already alluded to, p 340) may belong to this variety.

BERGAMOT OIL

Oil.—The rind of the fruit yields on expression the oil known under the name Bergamot. For this purpose the fruits are used, and one hundred of them are said to produce about three ounces of the oil. Formerly the oil was extracted by distillation or by expressing the rasped rind, but these processes have been superseded by a special instrument described in *Spons*.

OIL.
1259

General Characters of the Oil.—The oil referred to above, is of a greener tint than the oil of the orange. It is a clear, limpid liquid, with a peculiar and very fragrant odour, and a bitterish, somewhat warm, aromatic taste. Its specific gravity varies from 0.86 to 0.88, and its boiling point from about 361° to 383°. It has a slightly acid reaction, is mixable with rectified spirit, oil of turpentine, and glacial acetic acid, and is dextrogyre" (*Pharmacog*)

Chemical Composition.—The authors of the *Pharmacographia* say: "If essential oil of bergamot is submitted to rectification, the portions

CHEMISTRY.
1260

C. 1260

CITRUS
Medica.

The Citron.

The sweet lime (*C. Limetta*) appears to be the southern manifestation of the species, and the writer would be disposed to look for the lemon in the far east, if not in China, even although the Chinese names for it do not occur in the ancient writings. As a cultivated plant, it may have spread from China to India before it had attracted much attention in China itself. Although not wild, the plant is more frequent in Assam than in Bengal, and it is possible it may have entered India across the Chino-Assam frontier.

This species includes as varieties the Citron, the Lemon, the Sweet and the Sour Lime.

Var. 1. *Medica* proper.

THE CITRON, CEDRAT-TREE, ADAM'S-APPLE, *Eng.*; CEDRATIER, CITRONIER, *Fr.*; CIBRATO, CÍDRO, *It.*; CIDRO, *Sp.*; CIDREIR, *Port.*; CEDRATEN, CITRONENBAUM, *Germ.*

Considerable difference of opinion prevails as to the origin of the word Citron. It is presumed that the Median apple was synonymous with the

Syd.—*C. AURANTIUM*, var. *MEDICA*, *W. & A. Prodr.*; *C. MEDICA*, var. *A.*, *Linn.*; *CITRUS MEDICA*, *Risso.*

Vern.—*Bisaura*, *limbu*, *kulla*, *bara nimbu*, *thranj*, *nimbu*, *limu*, *HIND.*,
BEQA;
maha-
DUK;
nara;
bya-
Gana;
Japura;
ARAB,
sh-waza

khara, *sh-on takhava*, *BURM.*; *Sedaran*, *SING.*

Rt

, *U*
iry of
o the
S

"Sakund Hill," the *khásia*
 ar and along
 the worm

The Citron, The Lemon.

CITRUS
Medica.

History.—The citron is supposed to have been introduced into Greece and Italy from Persia and the wa

Theophrastus as abundant in may have been known to the Captivity According to Galesio it was introduced into Italy about the third or fourth century. The Jews cultivated citron when under the Roman rule, and used the fruit, as at the present day, in the Feast of Tabernacles, each person bringing a citron in his hand. Dr Royle found the species growing wild in the forests of Northern India, and, as already stated, it may therefore fairly be conjectured that the original home of the citron was in India. It has now spread over the whole of the civilised world, and even in cold regions it is cultivated under artificial heat.

Gum—Said to yield scantily an unimportant gum Sent from Malulipatam to the Madras Exhibition in 1855.

Oil—The flowers yield on distillation a very fragrant oil resembling neroli, which is chiefly used for the manufacture of Hungary water. Another perfume known as Cedrat is obtained from the rind of the fruit, both by distillation and expression The extract of cedrat is only the essential oil of citron dissolved in spirits, to which bergamot is sometimes added. (*Piesse*)

Medicine.—Citron RIND is hot and dry and tonic; PULP cold and dry, SEEDS, LEAVES, and FLOWERS hot and dry, JUICE refrigerant and astringent. According to Theophrastus the fruit is an expellent of poisons

a
k
sedative (*Year-Book, Pharm., 1874, 623*)

Special Opinions—§ "The rind is made into a marmalade and is an antiscorbutic" (*Surgeon-Major A. S. G. Fayalar, Muskat*) "It is made into preserve and is used for dysentery" (*Surgeon-Major*

India as large, aromatic, pulp scanty, sub acid The rind makes good confit, the pulp is also preserved in sugar. Both fruit and preserve are somewhat bitter to the taste The rind of the fruit candied is well known as a delicate sweatmeat. Atkinson says the wild fruit is used for pickling (*khatai*). Dr. Bonavia remarks that citrons are very little used in India, except for medicinal purposes "On the Western coast of India, they have many large varieties, and at Mangalore they eat the thick sweet skin after peeling off the bitter rind In Lucknow, and in Rampur, Rohilkund, and other places they make a preserve of the thick skin of the citron, which they call 'Turunj.' All the citrons, both sweet and sour, have a dry pulp."

Structure of the Wood—White, moderately hard

Domestic Use.—The fruit put amongst clothes keeps away moths.

Var. 2 *Limonum, sp. Risso.*

The word lemon is from the Arabic *limūn*, and this, through the Persian, is the Hindi *limu*, *limfu*, or *nimbu*, probably adopted by the Sanskrit people Much stress is by authors laid upon the fact that the

birā nimbu or large *nimbu* /

GUM
I271
OIL
I272

MEDICINE.
Rind
I273
Pulp.
I274
Seeds
I275
Leaves
I276
Juice
I277
Marmalade.

I278
FOOD
Fruit
I279
Confit.
I280
Candied Rind
I281
Pickles.
I282
Preserve
made of skin.
I283

TIMBER
I284
DOMESTIC
Var 2
Limonum
I286

The Lemon, The Sour Lime.

CITRUS
Medica.

MEDICINE

§ "Lemons, as well as other fruits of the same order, contain a principle—*hesperidene*. By some chemists this substance is described as bitter and crystalline, and by others as tasteless. Gladstone obtained from oil of lemon peel a substance of a pale yellow colour which he called hesperidene the flowers of Citrus decu-

r of Chemistry, Calcutta)
ed from lemon or lime juice

Citric acid.
1293

It occurs in colourless crystals, is very soluble in water, less soluble in rectified spirit, and insoluble in pure ether. The chief use of citric acid in medicine is in the preparation of effervescing draughts and refrigerant drinks, dose being from ten to thirty grains.

§ "The amount of free citric acid contained in Indian limes appears to be somewhat less than that found in the varieties cultivated in Europe, and varies from 25 to 30 grains of u
(*Surgeon C F H Warden, Profess*

Lemon Syrup.—In the Pharmac
are given for the preparation of th
peel two ounces, lemon juice, strained, one pint, refined sugar, two
pounds and a quarter. Heat the lemon juice to the boiling point, and
having put it into a covered vessel with the lemon peel, let them stand

Syrup.
1294

sloughing of the mucus membranes. I have given 12 ounces a day in apparently hopeless cases with success" (*From a Contributor*). "Lemon oil mixed with glycerine is applied on the eruption of acne" (*Surgeon and gunpowder used topically for scaly, Rajshahye*). "The fruit in the form of the spleen" (*Surgeon F C Penny,*

Amritsar)

Food.—The lemon juice is used largely in sherbets and cooling drinks. The fruit is also pickled.

FOOD
1295
1296

Var 3 acida.

THE SOUR LIME OF INDIA

Syn.—C ACIDA Roxb *Fl Ind*, Ed C B C 589 (Roxburgh appears to include under this name the C. Limetta, Remedies) as having and not to the South. If this proves correct

Vern.—Lebu, nebu limbu nimbu liman n bu, lma HIND, Lebu nebu, limbu, nimbu, pati nebu kagaji nebu BENG, Nimbu, kullah nim nimbu GUJ, Limbu, Mar Lim nich-cham pasham elemitchum pandu, nemmapandu TEL, jonakam naranna, jeruk nipis Jambira limpaka, nimbuka Litun, limue hamis nimu, li Thanbaya, samya si, tambya si, BURM, Dehi, SINGH

References.—Brandis *For Fl* 52, Stewart, *Pb Fl*, 29, DC *Origin*, Cult *Fl*, 179, U C Dutt *Mat Med Hind*, 226, Arncliffe, *Mat Ind*, 1, 193 Atkinson *Him Dist* 710; McCann, *Dyes and Tans Bengal*, 159 *Kew Off Guide to the Museum*, 25, *Kew Off Guide to the Bot Gardens and Arboretum*, 64

The Lemon; The Sour Lime.

CITRUS
Medica.

MEDICINE.

§ "Lemons, as well as other fruits of the same order, contain a principle—*hesperidene*. By some chemists this substance is described as bitter and crystalline, and by others as tasteless. Gladstone obtained from oil which he called hesperidene. the flowers of *Citrus decur* of Chemistry, Calcutta)
and from lemon or lime juice.

Citric acid.
1293

It occurs in colourless crystals, is very soluble in water, less soluble in rectified spirit, and insoluble in pure ether. The chief use of citric acid in medicine is in the preparation of effervescing draughts and refrigerant drinks, dose being from ten to thirty grains.

(Surgeon L. J. H. Warden, Professor of Chemistry, Calcutta.)

Lemon Syrup—In the *Pharmacopæia of India* the following directions are given for the preparation of this substance: "Take of fresh lemon peel two ounces, lemon juice, strained, one pint, refined sugar, two pounds and a quarter. Heat the lemon juice to the boiling point, and having put it into a covered vessel with the lemon peel, let them stand 12 hours. Strain the sugar in the filtered liquid 12 weigh three pounds and a half

Syrup.
1294

Most useful in dysentery with sloughing of the mucus membranes. I have given 12 ounces a day in apparently hopeless cases with success" (From a Contributor). "Lemon oil mixed with glycerine is applied on the eruption of acne" (Surgeon

Amritsar)

Food—The lemon juice is used largely in sherbets and cooling drinks. The fruit is also pickled.

FOOD.
1295
1296

Var. 3. *acida*.

THE SOUR LIME OF INDIA.

Syn—C ACID, Roxb, Fl Ind, Ed C B C, 589 (Roxburgh appears to include under this not merely the Sour Lime but all Lemons.) The C Limetta, *Aciso*, described by many authors (e.g. Dr Rice in *New Remedies*) as having a "very acid even acrid. juice, must refer to this plant and not to the South Indian sweet lime, the juice of which is sweet and pleasant. If this proves correct the synonyms may require to be rearranged.

Vern—Lebb, nebb, limbu, nimba liman, nibb, lemd, Hind; Leb, nebu, limbu, nimba, pati nebu, kagay nebu, kagay nimba, campal-nebu, tulu, nebb Beng; Nimba, kutak-nimbu, In, Akh'a limbu, lebu, limbu-nimbu, Guj; Limbu, Mar; Liman, niba, nimba, lima, Dik; Elmich-champasham, elemitcham, elemichumpullam, TAM; Nimmapandu, nimmapandu, Tel; Nimbrakannu, Kan; Cherru-naranna, jonakam naranna, jerak, nipa, limpa, elemich-narradum, MALA; Tamira limpika, nimbuka, vyapna (according to Dutt), Siva; Limun, limar-kamis, nimu, lima, Arab; Limu-tursh, limu, Pers; Thanava, samya si, tamiyasi, Bux, Dohi, SINGH

References—Franks, For Fl, 52; Struth, Ph Fl, 27; DC Origiu, Cut 11, 179, t C Dutt, Ma' Ed Hind, 22; Amis, Ma' Ind, 1, 163; Atkinson Him Dist, 710; McCann, Vires and Tana, Benga, 127; New Op Guide to the Museum, 25; Agr. Of, Guide to the Bot. Gardens and Arboretum, 64

The Sweet Lime, The Sweet Lemon.

CITRUS
Medica.

not a village in the whole of India where the *kaghas-nimbu* would not readily grow." "Although they are called limes, I believe them to be an s of India." "They call them *sherbets*."

FOOD.

R1,695 Dr. Bonavia divides *

Citron lemon; "lemon proper," and a group of sour Citrus known by the name of *gungolee* and *behari* lemons

Var. 4. Limetta, W. & A., Fl. Br. Ind., I., p. 515.

1301

THE SWEET LIME OF INDIA.

Syn.—C *NOBILIS*, Lour., as in Kurr., For Fl. Burm., I., 197; Wight, Ic., t. 58, C *LIMETTA*, Risso. It might be asked, has the C *LIMETTA*, Risso, sweet or bitter fruits? if the latter, it might be viewed as a synonym of var. *acida*.

Vern.—*Mitha nebu*, *nembi*, *mitha amrit phal*, HIND; *Mitha nebu*, BENG; *Mitha-nimbu*, PE; *Mitha limbu*, GUJ; BOMB; *Elemitchum*, TAN; *Nemba pandu*, *gajonimma*, TEL; *Erumitchi narracum*, MALA; *Madhukarkatikā*, SANS; *Thanbaya*, BURM; *Dehi*, SING.

References.—*Reverend* For ...

Stewart, Pb

179; Atkins

Sumery, 150,

Manuf., III

Habitat.—Commonly cultivated in most parts of India and Burma. Most probably a native of Southern India; Wight says it is indigenous at Kolagberry in the Nilgiri hills

Botanic Diagnosis.—Leaves with winged petioles, flowers small, white, fruit globose or ovoid, shortly mamillate, rind with concave vesicles

The limes approach much nearer to the true oranges than do any of the other forms of C. *Medica*. Indeed, it is difficult to say how far the published accounts of C. *Limetta* have become mixed up with C. *Bigaradia*, and the vernacular names given to both these forms, as

Many of

pages 340

C. *nobilis*

by others

under C. *Bigaradia*

Medicine.—§ "Extensively used as refrigerant in fever and jaundice" (Surgeon F. C. Penny, Amritsar)

MEDICINE

1302

Food.—The fruit is both eaten fresh and after being preserved or cooked in various ways, but the juice is not so much valued as that of the preceding variety.

FOOD.

1303

Var. 5. Lumia, W. & A., Fl. Br. Ind., I., 515.

1304

THE SWEET LEMON, Eng.; LUMIE, Fr. & Germ.

Vern.—See C. *LIMETTA*

Habitat.—This form is very little known in India, and occurs only occasionally in the Indian

Indian

lime

tinged ... but bright yellow, ovoid-oblong, with a long curved mamilla, rind with convex vesicles; pulp sweet.

C. 1304

CLAUSENA
indica.

The Mandarin or Maltese Orange.

OIL.
1305

Essential Oil.—Dr. Rice says that this oil is prepared at Squillace in Calabria by mechanical means.

1306

Citrus nobilis, Lour.

THE MANDARIN ORANGE, sometimes also called the MALTESE ORANGE.

Syn.—*CITRUS CHINENSIS* and *C. BARTIFOLIUS*

Vern.—Probably the same as for *C. LIMETTA*, it is the *kán* of China.

Habitat.—Cultivated in China and Cochin-China, where it appears to

1307

Mandarin. Mr. Clarke reports that its cultivation on the Khásia hills has been greatly extended. Dr. Bonavia speaks in the highest terms of the blood oranges of Gujranwala and of Jaunpore. New to European gardens at the beginning of the present century, but now cultivated plentifully in Sicily and Malta, known as *tangerines* in St. Michael's.

Botanical Diagnosis.—A moderate-sized tree; fruit uneven in surface, spherical but flattened on the top; rind very thin, dark reddish-yellow; pulp almost blood red with a peculiar flavour; both leaves and fruit have the same odour.

ENCOURAGEMENT OF
CULTIVATION
IN INDIA.

1308

when they are more pecuniarily famous. He urges that the blood oranges of Gujranwala and Jaunpore should be fostered and developed, as these are not only the finest oranges met with in India, but would come into market in the hot season when no others are available, that the tree

that Lahore should give attention to its pear-shaped *karna* and the large, sour, and juicy lemon known in the Panjáb as *gulgul*; and that Bombay should prepare to meet the Indian demand for its excellent pomelos. In this way, with extended railway communication, free interchange and a more constant and unroughout the year. "By re- scale, to those localities to would be trained, who would articular variety, and would grow up conversant with the best modes of dealing with it, not only with regard to the cultivation and propagation, but also with the best modes of packing and preserving the fruit for a long time."

CLAUSENA, Linn ; Gen. Pl, I., 304.

1309

Clausena indica, Oliv ; Fl. Br. Ind, I, 505 ; Beddome ; RUTACEÆ.

Syn.—*PISTOSTYLIS INDICA*, Dals ; Dals, & Gibs, Bomb Fl, 29 ; BERGERA NITIDA, Thw, Enum Ceylon Pl, 46

Vern.—*Migong-karapichi-gass*, SING.

Reference.—Lisboa, U. Pl of Bomb, 33

C. 1309

Ergot of Rye.

CLAVICEPS
purpurea.

Habitat — A shrub or small tree, met with in the Western Peninsula from the Bombay Ghats to the Anamally Hills, and also in Ceylon
 Structure of the Wood — Close-grained and hard, adapted for the lathe

Clausena pentaphylla, DC, Fl Br Ind, I, 503

Syn — AMYRIS PENTAPHYLLA, Roxb Fl Ind, Ed C B C, 321

Vern — Rattanjote, surj mukha teyrur, HIND

References — Brandis, For Fl, 49, Gamble, Man Timb, 59

Habitat — A deciduous shrub native of the Sub Himalayan tracts, from Kumaon to Nepal, especially the sal forests of the Duns and of Oudh

Medicine — The bruised leaves are highly aromatic, and are believed to possess medicinal properties

TIMBER
I310
I311

MEDICINE
Leaves
I312

CLAVICEPS.

Claviceps purpurea, Tulane, FUNGI

THE ERGOT, ERGOT OF RYE, HORNED OR SPIKED RYE (*Secale Cornutum*), BUNT

Syn. — SCLEROTIUM CLAVUS, DC ERGOTÆTIA ABORTIFACIENS, Quek
 OIDEUM ABORTIFACIENS, Berk & Br

References — Pharm Ind, 251, O Shaughnessy, Beng Disp, 631, 673,
 76, Balfour, Agri Pests of India 61, 115, Flück & Hanb, Pharma
 cog, 740, Benil & Trim, Med Pl, IV, 303, U S Dispens, 15th
 Ed, 5567

Dr R. Tytler (in the Cal Med Phys. Trans, 1831, vol V, p 441)
 reports that barley in the Upper Provinces of India is often affected with
 a disease very similar to, if not identical with, ergot of rye. The diseased
 grain is spoken of as being very poisonous. This same, or apparently the

I313

wheat districts
 being carefully

Medicine —

produced within the paleæ of the common rye, *Secale cereale*, forms the
 official part. In medicinal doses ergot acts principally upon the mus-
 cular fibres of the uterus, causing them to contract strongly and continu-

MEDICINE,
I314

thus, from the uterus.

"In overdoses ergot produces nausea, vomiting, colicky pains, head-
 ache, and sometimes delirium, stupor, and even death. Taken for a
 length of time, as in bread made with diseased rye, it acts as a poison,
 producing two conditions of the constitution, termed respectively, gan-
 grenous ergotism and convulsive ergotism, both accompanied with formi-
 cation" (Bentley & Trimen)

C. I314

Brick-Clay.

CLAY.

abundance, for bricks were employed in many buildings in India long anterior to the arrival of the English. Some of an enormous size are found in the ancient monuments, and in more recent times others much smaller than the European type.

Ball says: "As a rule Indian-made bricks do not bear a very high reputation for strength or durability, but it has been demonstrated that good bricks can be made, and it seems probable that, in many cases where the bricks are bad, the system of manufacture, rather than the material, is to blame. Of course there are some *kankar* nodules that without grinding

free from these impurities
 at Akra near Calcutta
 turned out annually
 in India see the Rurki

II—EDIBLE AND MEDICINAL CLAYS AND FULLER'S EARTH.

I319

In most bazaris in India a fine unctuous or oily clay is sold as a drug or as an article of food eaten by *enceinte* women, or used by ladies as a cosmetic. Allied to this is the clay used to effect caste markings on the forehead. Balfour says such a clay "is excavated from a pit near Koluth in large quantities, and exported as an article of commerce, giving a royalty of Rs. 500 yearly. It is used chiefly to free the skin and hair from impurities; their complexions."

of the rivers is used a clay before being washed. persons excavating a pale yellow mud from a hillock near the capital of Manipur, which he was informed was regularly eaten by the women throughout the State. Irvine (*Mat. Med. of Patna*, 66) says *multani mittie*—a kind of light yellow ochre—eaten and used as a cosmetic. 5 to 30 grs. Sakharam Arjun (*Bom mulatani mitti* "is eaten by pregnant stomach and is given mixed with sugar in cases of leucorrhœa." He further comments on an imported earth known as *Sang-i-Basri* (a Persian name) "This is generally imported from Bassorah and the Persian Gulf, as its name implies. It is used in tonic preparations and in irregular menses and with benefit from the iron it contains." He states that the earth in question is a silicate of alumina with lime and iron. U. O. Dutt (*Sans Mat. Med*) after dealing with red and yellow ochre (which see) or the *geru mati* in Beng., and *garrika* in Sans., adds "besides *garrika* several other varieties of earth are described and occasionally used in medicine. A sweet-scented earth brought from Surat for product of Surat it is nowhere (so far as the writer can discover) described as such."

Multani
I320

CLAY.

Edible Clay.

the source of a product may be inferred from its name. Under his account of Rawalpindi, Mr. Dalton Powell says of *mitti* *gi hni*: "This is a soft and spongy deal-coloured earth, something like fuller's earth, and in small pieces; it is used for clearing the hair, also in need dress; it is to be had in every bazar, where it is called '*mitti Multani*' or '*gilu-Multani*'." Capt. F. R. Pollock, on Dera Ghazi Khan reports, "it is stated that this *Multani mitti* is imported to Dera Ghazi Khan from the interior of the western range (Su'umani) to the extent of 10,000 maunds." The Assistant Commissioner of Multan writes: "although it would appear Multan is famous for its *mitti* or earth, yet there are no mines or pits here which produce the substance. It is imported from the sand pits of the western range." [

1321

1322

1323

which
give no information as to its source.

as indicated
or quasi-
are most
used earth
'Fuller's
(170) gives
opposition
r's earth.

His account is of so much interest that we may reproduce here the main facts from it: "Being of detrital origin fuller's earth does not possess the described composition having been employed in India since the earliest times, and doubtless for many other purposes. Its nature afford the principal part of those The practice of eating earth is widespread

possible that the practice of eating them is not limited merely to pregnant women, as is sometimes stated."

easily given up,
usually baked clay
to be made by
gives the follow-

ing as the best known Indian sources of this earth:

Bengal.—The *sabun mitti* or soap-earth of Colgong in the Bhagalpur Division. The earth sold in Calcutta as *Rajmahal mitti*, a comestible earth, the precise source of which is not known.

—Ajmir.
mentions that fuller's
Over 2,000 camel-

Sabun Mitti.

1324

1325

1326

Fire Clay.

CLAY.

Bombay and Sind.—A pale greenish clay is found in Western Sind, and is also eaten by pregnant women. In Multan already alluded to; in the same place a lavender-coloured clay is found.

1327

1328

III.—FIRE CLAYS.

1329

These derive their name from their refractory nature—that is to say, from their capacity to resist very high temperatures without fusing, fissuring, or altering their shape. The essential character of such clays is that they should be as near as possible free from lime, iron, or alkaline earths which promote the fusion of silica as in glass-making. In Europe the best clays for this purpose are those from the floors or underclays frequently found below coal seams; they exhibit impressions and carbonised remains. There is little doubt that the coal-fields of England, still the best brick material, the underlying

1330

fire-brick clay of good quality is believed to exist. Balfour states; "fire-

Beyrout, 20 to 30 feet below the surface, is used for fire-bricks and for lining furnaces." Ball makes no mention of these South Indian sources of fire-clays, but he remarks that "it is probable that, with proper manipulation, some of the pottery clays" "would afford perfectly refractory

bricks and crucibles be equal to the best. He describes his preparation of one part of fuller's earth at a red heat. The crucibles so made, he says, are perfectly infusible and impermeable to melted metals or saline matters, and bear sudden heating

1331

only goes as far as fire-clay obtained in the coal measures of the Raniganj District, and this we consider as good as the best English fire-clay. For your information we beg to quote some extracts from the official report of trials made at Her Majesty's Mint, see pages 18, 19, and 20, part I, volume VIII of Records of the Geological Survey of India, 1875, which are as follow:—

"(1) First experiment in September 1874 by Theodore W. H. Hughes, Esq., F.G.S., A.R.S.M., Officiating Deputy Superintendent, Geological Survey, India

"The fire-bricks tested by me were furnished by the firm of Messrs. Burn and Company. The materials from which they are made are very refractory and capable of resisting high temperature, without sensibly fusing. That, compared with Stourbridge fire-bricks, they are somewhat superior.

CLAY.

Pipe Clay.

"The specimens were subjected to a temperature of over 3,000° Fnt., the melting point of cast-iron being 2,786° Fht."

"Second experiment in January 1875 by H B Madlicott, Esq, M.A. F.G.S."

"Sc."

or of vitr

Whitelaw, Manager of the Bengal Iron Company's proposed works and others, who agreed in the favourable estimate formed of the quality of these bricks"

"In addition to the foregoing we beg to quote you the opinions of D. W. Campbell, Esq Railway, and J. Blackburn ntal Gas Com-pany. The fo 875, writes:—

"(2) I ha they are both very good; I esent stock is exhausted."

"And Mr. Blackburn, in his letter of 2nd March 1875, states as follows:—

"(3) The Gas retorts made for the Company by your firm two years ago have since been kept in constant use at a temperature of about 2,000° Fht., and they have been found fully as durable and effective as those of the best English manufacture"

tion r

in cas

herew

Raniganj District.

I332

IV.—PIPE CLAYS.

This is known as *Namam* in Tamil and *Aharra* in Dukhin; its English name is taken from the fact of its being used to manufacture tobacco-pipes. It much resembles China clay, only that it possesses more silica Balfour says; "This is found in abundance in several parts of India, the Hindus employ it for making the distinguishing then applied to parts of here referred edible and

into china or fuller's earths Ball makes no mention of pipe-clays occurring in India. Blanford states that a thick bed of true pipe-clay exists between Terany and Kauray in Trichinopoly.

I333

V.—POTTERY CLAYS.

These might be popularly referred to three sections or degrees of purity: (a) porcelain or kaolin clays, (b) ordinary white or glazed pottery clays, and (c) red or tile and flower pot clays. In every province, indeed in almost every district of India, one or other of these clays occur There is pottery. earthen v using mo practice o clays ex

The European pottery, that of Messrs. Burn & Co, of Raniganj, in

C. I333

Pottery Clay.

CLAY.

Bengal, is attempting to compete with European imported articles. Under the care of the School of Art, an effort is being made to utilise the white clays or kaolins of Madras, and Mr. George Terry of Bombay has

the fine clays of Distsimt, Devonsimt, and Coln, is the Indian potter, whose only resource, with one or two unimportant exceptions, is the brick earth of the plains and rivers. Fuel, which is of equal importance with potting minerals, is scarce, and coal has never been used by the native artizans. In Bengal, coal is used by the native brick-maker

workers in earth, viz., *Kumhars* and *Kashigars*. The former are the common village potters who "produce wares which, though of little technical value as pottery and of small commercial importance, are often good in colour and form, and perfectly fitted for the purposes they are intended to serve." The latter, the *Kashigars*, are "makers of glazed earthenware who are only to be found in the Panjáb and in Sind, and within the last few years in the town of Bombay and at Khurja in the North-Western Provinces. The name of the trade is Persian, derived probably from Kashan, the earliest seat of the manufacture, and the *Kashigar* is usually a Mussulman of good caste. In India the art has been, until recently, almost entirely architectural in its character and devoted to the covering of the wall surfaces of mosques and tombs with enamelled plaques and tiles. Persia may originally have borrowed the fashion from Tartar or Chinese sources, but there seems little doubt, notwithstanding some vague traditions as to its importation direct from China, that it was introduced into India by the Mussulman invasion, and not by means of the friendly intercourse which there seems reason to believe subsisted at various times with Tibet and the further East." Sir George Birdwood (*Indian Arts*) has recorded a high testimony as to the merit of the artistic forms of the common red pottery—forms which are seen portrayed on some of the earliest monuments of India. He has also spoken, with the highest admiration, of the elegant adaptations of the decorative designs with the forms and uses of the vessels which are turned out by the workers in glazed pottery. It is not within the scope of the present work to enter upon these subjects. Sufficient has been said to convey a general impression of the magnitude and character of the Indian ceramic art, and we may therefore conclude the present article with a brief abstract of the published facts regarding the clays met with in the provinces of India which are suitable for pottery, omitting all reference to the third class of clays, viz., the

CLAY.

Pottery Clay.

par and kaolin are obtainable in different parts of the district." "In the South Arcot district a fine plastic clay occurs in the Cuddalore beds near the south bank of the Guddalum," but it contains small quantities of lime and iron, the latter giving it a pinkish tint. In North Arcot the granite rocks of the district are decomposed to a certain extent, and, according to Mr. Foote, would yield a certain but not very considerable supply of kaolin. White goblets are made in Arcot which enjoy some reputation, but the source of the clay is not known. Fine pottery clays exist in great abundance in the district of Chingleput, more especially at Sripermatur. From the beds exposed at Coopum a supply has been taken for the Madras School of Art.

1335 2nd, Mysore.—For many years it has been known that kaolin earth existed in great abundance in this State, the beds extending from Bangalore to Nandydrug. When mixed with quartz these clays have been found to afford a valuable fire clay. Specimens of a white clay sent from Mysore were favourably reported on by Minton.

1336 3rd, Mangalore.—As early as 1841 Dr. Christie discovered, in association with the laterite, an extensive deposit of what he conceived to be pure porcelain clay.

1337 4th, Bengal.—In Orissa white clays occur in the Mahanadi valley of Rajmahal age. These clays are used by the natives for ornamenting their houses and in tanning leather. The Colgong clay has already been alluded to, it is of the same age as that used at Patharghata in the manufacture of pipes. In several parts of the Rajmahal hills there are beds of white silicious clays belonging to the Barakar coal measures which are suitable for the manufacture of many articles of hard pottery, and which, with proper treatment, would afford suitable material for fire-bricks. But the best known clays of this series are the refractory and other clays now being worked by Messrs Burn and Co. of Raniganj. The clay used at the pottery works is chiefly obtained from the coal-beds and consists of more or less decomposed shale, but a white lithomarge is obtained under laterite at a point about 12 miles north-east of Bankura. A certain amount of kaolin, Mr. Ball states, might be obtained from this area. White clays have also been reported from the Darjeeling District.

1338 5th, N.-W. Provinces.—In the year 1838, a Mr. J. Jeffreys established pottery works at Fatehgarh and produced articles with a very considerable degree of success. Black pottery is made at Azimgarh, which owes its colour to the organic matter present in the clay.

1339 6th, Punjab.—According to Mr. Baden Powell two classes of clays occur in this province—a grey clay which burns red, and clays which burn to a yellowish white or cream colour. Reference has already been made to some of these, but for pottery purposes the clays of Dera Ghazi Khan, Dera Ismail Khan, and Kohat deserve special mention. There are kaolin mines at Kassampur in the Delhi District, and also on the hills near the Kutub Minar. By washing, the quartz and mica are removed from these, and the kaolin pressed into the cakes which are sold for white-washing purposes, and may possibly also be used in pottery. Good kaolin is also reported to be found at Buchara near the Lota river in the Alwar hills.

1340 7th, Assam and Burma.—Rich deposits of porcelain clays have been reported to occur in Upper Assam near the Bhramakhund, known locally as rukmanigitha, and a fine clay for pottery purposes is also said to be found near the base of the cretaceous rocks at the western end of the Garo hills. In Burma the ordinary alluvial clay, mixed with sand, affords the material for common pottery, but a dark-coloured seam in the Irawadi valley is much sought after by the potters. Some of the upper beds in the nummulitic group are said to consist of China clay and would answer

Glazing and Colouring Pottery.

CLAY.

well for pottery, owing to their freedom from iron. Kaolin is also reported to exist in Tenasserim. Of the clays experimented with by Sir William O'Shaughnessy that from Singapore was said to be the best.

VI.—MATERIALS USED FOR GLAZING OR PAINTING POTTERY IN INDIA.

1341

The indigenous art of glazing pottery, as practised in India is crude and unsatisfactory. Ball says: "The varnish or imperfect glaze used for the sugar-boilers' pans, known in Bengal as *kolas*, is thus described by Mr. Piddington: There are two kinds of earth used, one of which is called *belutti*; it is a silicious and ochreous earth, the best being found 16 or 18 miles from Kulna. By levigation it is prepared for use, the process lasting, it is said, 15 days. The other earth is called *Uporoni*, and is a tenacious loam. The best was obtained at Monad, 20 miles west of Chinsurah, and at Panchchowki, 16 miles south-west of Kulna. Its preparation is said to take three months, and only 10 seers are obtained from one maund of the earth; two varieties of the *uporoni* are *gad* and *majari*. Successive layers of mixtures of *gad*, *belutti*, and *upo-*

1342

times an organic varnish is used for this purpose, except when, as mentioned in connection with Azimgarh, the clay itself contains the necessary organic matter to cause it to burn black. Artificially blackened pottery is produced at Monghir, Patna, Sarun, Chunar, and Surat. In the younger rocks of the Rajmahal series certain clays occur called *khari*. These are used as pigments. According to Buchanan the potters of Rajmahal use this *khari* for giving a white surface to pottery made of ordinary clays. Cheap pottery is often painted after having been baked, such as that seen at Kota, Lucknow, Benares, &c.; at other times it is powdered with mica, or by other mechanical means has a colour imparted to it. Black pottery is, for example, often etched, and a preparation of tin and mercury rubbed into the patterns in imitation of metal bidri-ware. With the exception of these miserable attempts the *kumhar* potter is innocent of the art of glazing his wares. A much more advanced knowledge is possessed by the *Kashgar*, indeed, the possession of this knowledge is the recognised characteristic of his trade. "The shades of blue which constitute the chief feature of the Sind and Panjáb pottery are produced by oxide of cobalt. The supply of this substance is limited to certain mines in Rajputana" (see Cobalt). Glazed pottery is made in Sind, chiefly at Hali, Hyderabad, Tattu, and Jerruck, and in the Panjáb at Lahore, Multan, Jhang, Delhi, &c. The chief places for the manufacture of encaustic tiles are at Bultji and Saidpur in Sind. Sir George Birdwood (p. 307) says, in the glazing and colouring, two preparations are of essential importance, namely, *kanch*, literally glass, and *sikka*, oxides of lead. In the Panjáb the two kinds of *kanch* used are distinguished as *angrezi kanch*, "English glass" and *dasi kanch*, "country glass." "The former is said to be made of *sing-i-sif*, a white quartzose rock, 25 parts; *sajji* or pure soda 6 parts; *sohaga telis* or pure borax, 1 part; and *nausaljar*, or sal ammoniac, 1 part. Each ingredient is finely powdered and sifted, mixed with a little water, and made into white balls of the size of an orange. These are red-heated, and after cooling again, ground down and sifted. Then the material is put into a furnace until it melts, when clean-picked *shora*

1343

Glazing and Colouring Pottery.

kalms or saltpetre is stirred in. A foam appears in the surface, which is skimmed off and set aside for use." The latter is similarly made of quartzose rock and borax or siliceous sand and soda. "A point is made of firing the furnace in which the *kanch* is melted with *likar*" (*Acacia arabica*), '*karir*' (A Catechu), or 'Cipparis wood' 'Four *sikka*, or oxides of lead, are known, namely, *sikka safed*, white oxide, the basis of the blues, greens, and greys used, *sikka sard*, the basis of the yellows, *sikka sharbat*, litharge, and *sikka lal*, red oxide" "*Sikka syed* is made by reducing the lead with half its weight of tin, *sikka sard* by reducing the lead with a quarter of its weight of tin, *sikka sharbat* by reducing with zinc instead of tin, *sikka lal* in the same way, oxidising the lead until red" "All the blues are prepared by mixing either copper or manganese, or cobalt, in various proportions with the above white glaze. The glaze and colouring matter are ground together to an impalpable powder ready for application to the vessel" "The *rita* or *saffre* is the black oxide of cobalt found all over Central and Southern India which has been roasted and powdered, mixed with a little powdered flint" Sir George further describes another process of preparing the *nila* or indigo blue glaze for use by itself, which consists in taking powdered flint 4 parts, borax 24, red oxide of lead 12, white quartzose rock 7, soda 5, zinc 5 and *saffre* 5, burning the mixture in the *kinchi* furnace as before.

"The yellow glaze used as the basis of the greens is made of *sikka* *sard*, white oxide 1 seer, and *sing safed*, a white quartzose rock or millstone, or burnt and powdered flint, 4 chittaks, to which, when fused, 1 chittak of borax is added."

"The green glaze produced are (1) *Zamruddi*, deep green (1 seer of green glaze and 3 c. of *Chumbha* or calcined copper), (2) *Sabz*, full green (3 c. of *Chumbha* and 1 seer of *Chittak* or borax is added), (3) *Chand*, pale green" by smaller

proportions of the wood of copper filings with *nimak shor*, wood, in his most interesting account of Indian pottery, proceeds "The colours, after being reduced to powder, are painted on with gum or gluten. The vessel to receive them is first carefully smoothed over and cleaned and, as the pottery clay is red when burnt it is next painted all over with a soapy, whitish engobe, prepared with white clay and borax and Acacia or Anogeissus gums called *kharya mutts*. The powdered colours are ground up with a mixture of *nishasta*, or gluten and water called *mawa*, until the proper consistence is obtained when they are painted on with a brush. The vessels are then carefully dried and baked in a furnace heated with *ber* (*Zizyphus*), or, in some cases, *Capparis* wood."

VII.—CLAYS OR EARTHS EMPLOYED AS PIGMENTS
OR DYES

See "Pigments" for further information as to colouring of pottery

Clearing Nut, see *Strychnos potatorum*, Linn , LOGANIACEE

CLEIDION, *Blume, Gen Pl, III, 329*

Cleidion javanicum, Bl. *Fl Br Ind*, V, 444. EUPHORBIACEÆ

Syn.—ROTTLEKA URANDA *Dals & Gids, Bomb Fl*, 230

Vero → *Okenropass eburn* Sing

References.—*h* For *Fl. Burm*, II, 390, *Be Idome*, *Fl. Sylv*, t
celxxxii, *Gamble Man Timb*, 348, *Thwaites, Kn Ceylon Pl*, 272,
Lisboa, U Pl Bomb, 123

The Clematis.

CLEMATIS
grata

Habitat — An evergreen tree met with in the tropical forests of North
ern and Eastern Bengal, South Ind, Burm, and Ceylon

Structure of the Wood — Uniformly white or yellowish, rather heavy,
fibrous but close-grained, soft, takes good polish, but is not durable. In
Madras it is used for building purposes

TIMBER
1349

[EUPHORBIACEÆ

CLEISTANTHUS, Hook f, Gen Pl, III, 268,

Cleistanthus malabaricus, Mull-Arg, Fl Br Ind, V, 276

1350

References — Gamble, Man Timb, 357 Lisboa U Pl Bomb, 120

Habitat — A small tree found in the Konkan and Malabar districts of
South India

Structure of the Wood — Lisboa mentions this plant amongst his use-
ful timbers

TIMBER
1351

C. myrianthus, Kurz, For Fl Burm, II, 370, Fl Br Ind, V, 275

1352

Vern — Mo-man tha BURM

Reference — Gamble, Man Timb, 357

Habitat — A moderate-sized evergreen tree of the tropical forests of
Burma and the Andaman Islands

Structure of the Wood — Moderately hard, reddish grey Weight
41lb per cubic foot

TIMBER.
1353

CLEMATIS, Linn, Gen Pl, I, 3

Clematis barbellata, Edgew, Fl Br Ind, I, 3, RANUNCULACEÆ

1354

Reference — Gamble, Man Timb, I

Habitat — A woody climber of the western temperate Himalaya,
Garhwal, and Kumaon

C. Buchananiana, DC, Fl Br Ind, I, 6

1355

References — Kurz For Fl Burm, I, 17, Gamble, Man Timb, I,
Royle, Ill Him Bot, I, 51

Habitat. — A large woody climber, occurs throughout the temperate
Himalaya at 6,000 feet

C. Gouriana, Roxb, Fl Br Ind, I, 4, Wight, Ic t 933-4

1356

References — Roxb Fl Ind Pd C B C 457 Kurz, For Fl Burm, I,
16, Gamble, Man Timb I, Thwaites En Ceylon Pl I Dals & Gills,
Bomb Fl I Atchison Cat Pb Pl I, Voret, Hort Sub Cat, 2,
O Shaughnessy, Beng Dispens, 160, Royle, Ill Him Bot, I, 44 51,
Balfour, Cyclop

Habitat — An extensive climber found in the hilly districts from the
Western Himalaya, rising up to 3000 feet, to Ceylon and the Western
Peninsula

Medicine — This plant and some of the other species abound in an acrid
poisonous principle. The LEAVES and fresh STEMS, if bruised and applied
to the skin, cause vesication. In France the C vitalba, Linn, is used by
mendicants to cause artificial sores for the furtherance of their impostures

MEDICINE.
Leaves
1357
Stems
1358

C grata, Wall, Fl Br Ind, I, 3

1359

Vern — Ghantali, biliri HIND

References — Gamble, Man Timb, I, Wight, Hort Sub Cal, 2, Royle,
Ill Him Bot, I, 44 45, 51, Balfour, Cyclop

CLEOME
viscosa

Wild Mustard

Habitat.—A climber of the sub-tropical and temperate Himalaya at 2,000 to 3,000 feet.

1360 *Clematis montana*, Ham.; *Fl. Br. Ind.*, I, 2.

Vern.—*Ghandli*, Hind

References.—*Gamble, Man Timb*, I.; *Royle, Ill. Him. Bot.*, I, 45, 51

Habitat.—A woody climber of the temperate Himalaya, from the Indus to the Bramaputra, ascending to 12,000 feet, always above 8,500 ft. Sikkim, and in the Khasi Hills, Manipur, above 4,000 feet.

1361 *C. napaulensis*, DC.; *Fl. Br. Ind.*, I., 2.

Vern.—*Paxanne*, *birri*, *mandat*, Pa

References.—*Stewart, Pb Pl.*, 3; *Royle, Ill. Him. Bot.*, 23

Habitat.—Found in the temperate Himalaya from Garhwāl to Bhutar
Medicine.—In Kanawar the LEAVES are said to act deleteriously on the skin.

MEDICINE.
Leaves

1362

1363

C. triloba, Houtt.; *Fl. Br. Ind.*, I, 3

Vern.—*Moraveta*, *mortel*, *mortel*, *ranjar*, *ranyai*, Boms, *Moraveta*, Mar

References.—*Dals & Gibb, Bomb Fl.*, I, *Dymock, Mat. Med. W. Ind.* 2nd Ed., 21; *S. Arjun, Bomb. Drugs*, 2

Habitat.—An extensive climber met with in the mountains of the ... and West Konkan

MEDICINE
Plant

1364

FIBRE.

1365

Distillate.

1366

of hill districts. Bracconot has pointed out that the acrid active principle may be distilled with water and is soluble in fixed oils

CLEOME, Linn.; *Gen. Pl.*, I, 105, 968.

Cleome pentaphylla, see *Gynandropsis pentaphylla*, DC.; *CAPPARIDÆ*

1367 *C. viscosa*, Linn.; *Fl. Br. Ind.*, I, 170, *Wight, Ic.*, I, 2

Sometimes called WILD MUSTARD

Syn.—*C. ICOSANDRA*, Linn., *POLANISIA VISCOSA*, DC.; *P. ICOSANDRA*, W & A

Vern.—*Kanphuts*, *hukhar* (or *h*
Har-haria, BENG., *Hul ka*

swana-burbura,

References.—*Roxb. Fl. Ind.*, Ed. C.B.C., 501, *U.C. Dutt, Mat. Med. Hind.* 289, *Dymock, Mat. Med. W. Ind.*, 2nd Ed., 61, *Ainslie, Mat. Ind.*, II, 223, *O'Shaughnessy, Beng. Dispens.*, 205, *Murray, Pl. and Drugs Sind.*, 52, *Drury, U. Pl.* 351, *Baden Powell, Pb. Prod.*, 330, *Cooke, Oils and Oilseeds*, 37, *Atkinson, Him. Dut.*, 732, *Birdwood,*

C. 1367

or Hurhur.

CLEOME
viscosa.*Bomb. Fr.*, 276; *Lisboa, U. Pl. Bomb.*, 145; *Spens' Encyclop.*, 1415; *Balfour, Cyclop.*

Habitat.—A common weed throughout the greater part of India, appearing in the rainy season; very common in Bengal and South India.

Oil.—The seeds yield a light olive-green-coloured limpid oil when subject to a great pressure. It seems likely that this oil would prove serviceable where a very liquid oil is required. The oil could be prepared to any extent.

Medicine.—The juice of the leaves is poured into the ear to relieve ear-ache. According to Rheede, it is useful in deafness. Dr. Dymock writes that the juice mixed with oil is a popular remedy in Bombay for purulent discharges from the ear, whence the Bombay name of the plant

OIL
1368MEDICINE.
Juice
1369Leaves.
1370Seeds.
1371

"The small, compressed, netted-surfaced, notisif-tasteu SPEDS OF THIS
nitic and car-
tea-spoonful
diarrhoea,
jueezed into
"ji, Etaxali),
chutney to
promote digestion" (Surgeon-Major John North, Bangalore). "Used
to relieve ear-ache and as an astringent in cases of otorrhoea; the
ear should be syringed well before its application" (Brigade Surgeon
J. H. Thornton, Monghyr). "Alterative, useful in secondary syphilis
and enlargement of the liver and spleen" (Surgeon-Major J. McD.
Houston, Travancore; and John Gomes, Esq, Medical Storekeeper,
Trevandrum) "The seed made into chutney has strong digestive
power" (Native Doctor Ummegndsen, Mettapolliam, Madras).

"The seeds of *Cleome viscosa* are anthelmintic, rubefacient, and vesicant; and diseases of also as a r
is used. 7

and, in addition to this, the juice possesses a curative influence over some cases of otalgia and otorrhoea, but the smarting it produces in

The
the
hot

water. The leaves are also applied to the skin in the form of a poultice or paste by bruising with vinegar, lime-juice, or hot water, and their juice

er. The
for two
or some

other purgative For children the dose is from five to twenty grains, according to their age. As a drug the leaves of *Cleome viscosa* are much superior to those of *Gynandropsis pentaphylla*. It is the former which possess a distinct foetid smell and efficient rubefacient and vesicant properties, and not the latter. The above plants are frequently found growing together and are often confused partly from a general botanical similarity between them, and partly on account of their native synonyms being almost the same. The close similarity of their seeds adds greatly to this confusion. There will be, however, no difficulty in

CLERODENDRON
inermis.

A Mild Antiperiodic.

MEDICINE.

distinguishing the two plants if due attention is paid to the following botanical characters:—

"*Cleome viscosa* — Siliqua flat, striated, pubescent, and sessile or short stalked; flowers yellow, stem and branches quite covered with viscid glandular hairs, small (see illustration).

strongly.

"As the seeds of both of these plants are very similar, I need not describe them separately. They are as follows: small, flat, and slightly acrid or bitterish in taste. They yield a small quantity of fixed oil on expression.

"As a rubefacient and vesicant, the seeds under examination are much superior to the mustard seed in this country, and quite equal to the mustard imported from Europe. If they can be reduced to as fine a powder as Europe mustard, I think they will be found to excel the latter also in remedial value" (*Honorary Surgeon Moodien Sheriff, Khan Bahadur, Triplicane, Madras*).

Food.—"The SEEDS of *Cleome viscosa* are much used by the natives, chiefly the Brahmins, in their curries; they are sold in all the bazars at a trifling price" (*Roxb*). Lisboa says that the PLANT is eaten boiled with chillies and salt as salad.

FOOD.
Seeds
I372
Plant.
I373

CLERODENDRON, Linn; Gen Pl, II, 1155

This name alludes to the variable properties of the species *kleros*, lot, and *dendron*, a tree

[VERBENACEÆ

I374

Clerodendron Colebrookianum, Walp., Fl Br Ind, IV, 594:

Vern — *Kadungbi*, LERCHIA

Reference — *Gamble, Man Timb*, 299

Habitat. — An evergreen shrub, with silvery-grey bark, met with in
Sik also in Burma
epchas

FOOD.
I375
TIMBER.
I376
I377

C. inermis, Gartin, Fl Br Ind, IV, 586

SVN — *VOLKAMERIA INERMIS*, Linn

PERFUMERY.
I378
MEDICINE
Plant.
I379

Habitat — A large, ramous often scandent evergreen shrub, common in tidal forests in Bengal, Burma, and the Andamans

Perfumery. — An exquisite perfume is said to be derived from the flowers of this plant (*Presse*)

Medicine — Dr Dymock says that the PLANT has a reputation as a febrifuge in remittent and intermittent fevers. This fact is supported by Dr. Sakham Arjun, who, upon the authority of Dr. Hojel, states that

C. I379

A Substitute for Chiretta.

CLERODENDRON
infortunatum

[Wight, Ic., t 1471

Clerodendron infortunatum, Gaertn; Fl Br Ind, IV, 594,

1380

Syn — VOLKANERIA INFORTUNATA, Roxb, Fl Ind, Ed C B C, 478, G
VISCOSUM VentVern — Bhant, bhāt, HIND, Bhant, ghentu, BENG, Kharbari, barni or
varni SANTAL, Kulamarsal, KOL, Chitu, NEPAL, Adung, LEPCHA,
Lukunah, MECHI Kals basuti PB, Kari BOM, Bhandira, kari,
MAR, Bockada, TEL, Peragu MALA, Bhāndira, bhanti bhantaka,
SANS, Ka aunggyi, bujphyi, khaoung gyi, BURM, Gas pinna SINGReferences — Brandis, For Fl, 363 Kura, For Fl Burm, II, 267
Bedd, For Man, 173 Gamble, Man Timb, 299 Thwaites, En Ceylon
Pl, 243, Dals & Gibs Bomb Fl, 200 Stewart, Pb Pl, 165 Wight,

Hab tat.—A pinkish white-flowered shrub, common in waste places throughout the greater part of India and Burma, and in the damp forests of Ceylon up to an elevation of 5000 feet. Grows gregariously, forming a dense under vegetation, specially associated with the Bamboo. On passing into fruit the calyx becomes scarlet, and the plant is then even more attractive than when covered with its scented flowers.

Medicine.—"Dr Bholanath Bose calls attention to the LEAVES of this plant as a cheap and efficient substitute for chiretta as a tonic and antiperiodic" (Pharm Ind) According to Dr Kanny Lal Dō, OIE, the fresh juice of the leaves is employed by the natives as a vermifuge, and also as a bitter tonic and febrifuge in malarious fevers, especially in those of children. Dr Dymock states that he has not seen the leaves used medicinally in Bombay, but they are bitter. Dr Hongberger mentions the use of the BARK in medicine by the Arabian and the Indian physicians.

MEDICINE.
Leaves,
1381

Julce
1382
Bark
1383

Special Opinions.—"The expressed juice is an excellent laxative, cholagogue and anthelmintic. It is used as an injection into the rectum in cases of ascarides. It is also a valuable bitter tonic, and the natives believe that its presence cures scabies in the locality" (Brigade Surgeon J H Thornton B A, M B, Monghur) "Is said to be a very useful antiperiodic" (Surgeon Major E Sanders Chittagong) "The juice of the fresh leaves is used as a febrifuge for infants and children" (P H B, Dacca) "The juice of leaves found to be an efficient anthelmintic" (Surgeon C J W Meadows Burrissal) "The decoction of the leaves is a powerful antiperiodic, and is a valuable adjunct to arsenic in the treatment of malarious fevers" (Civil Medical Officer U C Dutt, Serampore) "Decoction of the leaves is used"

Decoction.
1384

febrifuge" (Surgeon-

A. J. L. C. densa, A. J. L. C.

Domestic Uses.—Edgeworth mentions that this plant is used in the Ambala district to give fire by friction.

DOMESTIC.
1385

C. 1385

Clitoria Seeds—a Medicine used in Croup, &c.

CLOVES.

MEDICINE.

again has a sub-variety, in which the flowers are double. There is no distinct difference between the action of the seeds of these varieties, or if any at all, it is in favour of the white one. The plants are in flower all the year. The seeds are not generally sold in the bazar, but when they are, they are almost always of very inferior quality, in consequence of their being collected before their maturity. They should not be removed until

The seeds are flattened with the edges, minutely though not flattened. The immature seeds are flat and dark brown in colour, the matured thick and round seeds are an efficient purgative, and produce five or six motions in one drachm or one drachm and a half doses. Their action is increased in proportion to the increase of their quantity up to two drachms, when the number of motions is generally eight or nine. The seeds are one of those drugs which act very satisfactorily when used alone, but they may also be administered in combination with cream of tartar, in equal proportion, and with a few grains of ginger in each drachm of the compound powder. The dose of the compound powder is from a drachm and a half to two drachms. The fresh root, or rather root-bark, of *Clitoria Ternatea* is a

the symptoms of gonorrhœa and irritation of the bladder, as strangury, scalding of urine and frequency of micturition, and in some cases the gonorrhœal discharge itself is much abated under its use. One small root is generally a dose for children under two years, and one large root or two small ones for those between three and six years. For adults the dose is four or six roots if small, and three to five if large" (*Honorary Surgeon Moodeen Sheriff, Triflicane*). "There are two varieties of this plant one has white and another bluish-coloured flowers, for medicinal purposes the latter variety is preferable. Juice of the leaves mixed with

1409

and the ear in ear-aches, especially the neighbouring glands" (*Surgeon*). "Seeds purgative, root demulcent, dose, seeds powdered, 30 to 60 grains, root, one to two drachms of dry bark in powder" (*Apothecary Thomas Ward, Madanapalle, Cuddapah*). "Is used as a drastic purgative and diuretic in dropsy, also in cases of cystitis. The roots of the blue species are used as an antidote in cases of snake-bite" (*Brigade Surgeon J. H. Thornton, B.A., M.B., Monghar*). "The seeds are used as a mild purgative for children" (*Surgeon-Major J.*

1410

white flowers and the st" (*Native Doctor*). "a drastic purgative" (*Surgeon Shih Chunder*). "powdered root of this dropsy" (*Surgeon*

Major John North, Binger's)

Sacred Uses.—The flower is dedicated to the goddess Durga.

SACRED
USES.
1411

Clover, see *Trifolium pratense*, 1477, LEGUMINOSÆ.

Cloves, see *Caryophyllus aromaticus*, 1477, MYRTACEÆ.

C. 1411

COAL.

Coal.

CNICUS, Linn.; *Gen. Pl.*, II., 468.

1412

Cnicus arvensis, Hoffm.; *Fl. Br. Ind.*, III., 362; COMPOSITE.Syn.—*CARDUS LANATUS*, Roxb.; *Fl. Ind.*, Ed. C B C., 525.Vern.—*Bhur-bhur*, N-W-PReference.—*Smith, Dictionary*, 410

Habitat.—Found throughout India, especially in cultivated fields in the Gangetic plains, the common thistle of India

OIL.

Seeds

1413

Oil.—Produces small black SEEDS, which yield a large quantity of oil. The seeds are gathered by the poorer classes, and the oil expressed by them for their own use. It burns with smoke, is otherwise of good quality.

Cnidium diffusum, see *Seseli indicum*, W. & A.; UMBELLIFERE.

COAL.

1414

Coal.

CHARBON DE TERRE, *Fr*; STEINKOHLEN, *Germ*; CARBONI FOSSILI, *It*; CARVIES DE PEDRA, *Port.*; CARBONYS DE PEDRA, *Sp*Vern.—*Kōyelah* or *Kuela*, HIND; *Kōyali*, BENG; *Kōlā*, DUK; *Kari* or *Simal kari*, TAM; *Begga* or *Sima begga*, TEL; *Kari*, MAL; *Idallu*, KAN; *Koelo*, KIS; *Guj*; *Anguru*, CINA; *Fahm*, ARAB; *Zughal*, PERS; *Angdraka* SANS; *Mum*, MIDU-YE, BURMReferences.—So much has been written regarding Indian Coal that an enumeration of the publications would occupy many pages. The reader is referred to *Bill's Economic Geology*, pp 599-604, to the *Memoirs, Records of the Geological Survey*, and to the *Journals of the Asiatic Society of Bengal*. The following works may, however, be specially mentioned:—*Final Report of the Coal Committee*; *Dr. T. Oldham's Report on the**Annual Adminis.*

REGIONS OF INDIAN COAL.

The following account of the coal-fields of India has been furnished by Mr. H. B. Medlicott for this publication:—

1415

ABSTRACT OF THE FEATURES OF INDIAN COAL.

"India possesses extensive stores of coal, though none of it belongs to the so-called carboniferous period, and in India itself the coal-measure rocks are not all of one formation. All the coal of peninsular India occurs in the rocks known as the Gondwana system, the fossil flora of which has a monotonous character; and all the coal of extra-peninsular India occurs in rocks of cretaceous or tertiary age. In both cases the distribution is partial. The Gondwana coal-measures have only been found in the central and north-eastern provinces, i.e., in western Bengal, the Central Provinces, and the Nizam's Territory, only skirting the south border of the North-Western Provinces, with remnants in the extreme north-east of the Madras peninsula. The tertiary coal has been traced all along the eastern margin of the Indo-Gangetic plains from Sind to Pegu, but it is only in Assam and Upper Burma that valuable measures have been found where a certain coal occurs in workable quantity.

C. 1415

Coal fields of India.

(H. B. Medlicott).

COAL.

"In both regions the quality of the coal varies much, as in all coal-measures; but the best in both, reaches a very high standard, almost if not quite, up to that of high class English coals. In the Gondwana (Bengal) some an excess of ash is low, a lighter

fuel

	BENGAL		ASSAM	
	Average of 31	Best	Average of 23	Best
Fixed carbon	53 20	66 52	56 5	66 1
Volatile exclusive of moisture	25 83	28 12	34 6	33 5
Moisture	4 80	9 6	5 0	
Ash	16 17	4 40	3 9	4
	100*	100	100*	100

"In Bengal only the Bengali and the ...
largel
other
muhication.

"In the Cent-
and the Warora
work, and the
opened up

"In the Singareni and Sasti fields of the Nizam's Territories some
arried out pending the establishment of

has recently been started in the Makum

MORE DETAILED STATEMENT OF THE COAL-YIELDING DISTRICTS

"The mineral is more particularly developed in the central eastern portion of the Peninsula

SOUTH INDIA
1416

In the Madras Presidency it is found at—

"Beddadanol—Lat $17^{\circ}14'$, Long $81^{\circ}17'30''$ The field, about 38 miles from Rajahmundry, is about $5\frac{1}{2}$ square miles in extent, and contains four seams of very poor coal, worthless as fuel This is the most southern

$36'$, Long $81^{\circ}7'$ Has its
the River Godavari; on
ms of coal, of which only

"Lingalla—Lat 18° , Long $80^{\circ}54'$ Two seams, neither of which ex-
i, and another,

but still in the
Nizam's Dominions, is that near Singareni, lat $17^{\circ}30'30''$, long $80^{\circ}20'$.
There are five seams the thickness of one was not ascertained, those of the

* Since opened out

COAL

Coal fields of India.

others are respectively 6, 3, 3, and 34 feet. This coal answers well for smithy purposes and stationary engines, and was found to be a serviceable fuel when tried on the Madras Railway. Railway communication is now being rapidly pushed forward, and a colliery being started, coal reported of high quality.

"*Kamaram*—Lat. $18^{\circ}5'$, Long. $80^{\circ}14'$. Two seams of fair coal, 9 and 6 feet in thickness respectively. The available coal is estimated at 1,132,560 tons, its position is, however, unfavourable to its development.

"*Zandur*—Lat. $19^{\circ}9'$, Long. $79^{\circ}30'$. This village is situated about the centre of a strip of Barakar rocks, extending from Kaigura to Aksapali, and contains a 15-foot seam of fair coal.

"*Antergaon*—Lat. $19^{\circ}32'30''$, Long. $79^{\circ}33'$. South of this place a 6 foot seam occurs, 9 inches of which are shale.

"*Sastis and Paoni*—In the Nizam's Dominions, included in the Wardha area, a 50-foot seam occurs here, a considerable portion of which is of good quality. 30,000,000 tons of coal are estimated to be available from this source.

"*Talchir*, in Orissa.—The field is situated in the valley of the Brahmini, and it is about 700 square miles in extent. The coal is of an inferior quality. The field has not been practically explored.

"*Rajmahal Hills*—Over about 70 square miles on the western margin of the Rajmahal Hills, coal measure rocks are exposed, and these doubtless extend over a vastly greater area under the younger formations. Separated by these overlying rocks there are five distinct fields, namely, Hura, Chaparbhita, Pachwara, Mohonguri, and Brahmini. There is no continuity of the seams in each of these, while the data about them are very vague and incomplete. If the coal measures extend below the trap to the east, they would be close to the water carriage of the Ganges and hence transport would be cheap, but on the other hand the coal of this region is for the most part stony and bad.

"*Deogarh*—In the Jainti, Sahajori, and Kandit Karanah fields, coal of different qualities occurs. Some in the Jainti field is excellent, but that known from the Sahajori area is inferior.

"*Karharbari or Kurhurbali*, in the district of Hazaribagh.—This small field, having an area of 8 square miles, is of great importance on account of its position (about 200 miles from Calcutta by rail) and the good quality of its coal. The coal occurs in three principal seams, with an average total thickness of 16 feet, the estimated amount of coal is about 136,000,000 tons, while the available portion is estimated at about 80,000,000 tons, for steam work it is on the average superior to that of Raniganj. The chief companies possessing mines in this field are, the East Indian Railway, the Bengal Coal Company, and the Raniganj Coal Association. Should the output rise to 500,000 tons per annum, as is likely, the life of the coal-field will be 162 years.

"*Raniganj or Raneegunge*—This field is situated on the rocky frontier of Western Bengal at a distance of 120 miles from Calcutta. The available coal, exclusive of waste, is estimated in round numbers at 14,000,000,000 tons. The total area exposed is about 500 square miles, but the real area is possibly even double that, as the beds dip to the east under the alluvium. This is the largest and most important coal field in which coal is worked in India, its proximity to the main line of railway, and to the port of Calcutta, tending to give it pre-eminence over other less favourably situated localities. The principal companies engaged here in the extraction of coal are—the Bengal, Barakar, Fugateable, New Birbhoori, and Raniganj Association, besides many minor firms and native associations. Many of the seams are of considerable thick-

ORISSA

1417

BENGAL

1418

Coal fields of India.

(H B Medlicott.)

COAL.

ness, one containing from 70 to 80 feet of coal. As a rule, however, the best coal is not found in the very thick seams.

good deal, but there is much valuable fuel; the estimated available coal is 165 million tons. The immediate communication would bring it into communication with the proposed railway.

"**Bokaro.**—This field is situated in the Damuda valley and commences at a point 2 miles west of the termination of the Jharia field; its area is about 220 square miles. The quality of the coal is fairly good. Some of the seams are of a large size, one being 83 feet in thickness; there is here a large store of valuable fuel available (about 1,500 million tons).

by the natives and carried to Ranchi for sale.

"**North Karanpura.**—Situated at the head of the Damuda valley, has an area of about 472 square miles, and the estimated amount of coal is 8,750 million tons.

"**South Karanpura.**—Situated to the south-east of the northern field, has an area of 72 square miles, and the estimated amount of coal is 75 million tons. The assays of some of the coal indicate a high calorific power.

"**Chhope.**—Is a small field of less than a square mile in extent. Situated on the Hazaribagh plateau.

"**Ikuri.** 25 miles north-west of Hazaribagh. A few seams of inferior coal are exposed.

"**Anrunga.**—In the district of Lohardaga, in the valley of the Koel, a tributary of the Son. The area is 97 square miles, and the estimated amount of coal is 20 million tons, but the quality of the coal as taken from the outcrop is poor.

"**Hutar.** to the west of the Arunga field has an area of 786 square miles. The assays of the coal gave favourable results.

"**Daltonganj.** also in the valley of the Koel, area 200 square miles. The seams are not numerous. One, which has a thickness of 6 feet, contains excellent fuel. The estimated total available amount of coal is 11,600,000 tons.

"**Tatapani, Iria, and Morne.**—Situated in the valley of the Son and tributaries. These fields are portions of a large tract stretching far to the westward. Several coal seams of workable thickness and many thin ones exist.

"**Singrawli.**—Is a small field of coal, which is now abandoned.

"**Sohagpur.**—Is a small field of coal, which is now abandoned.

"**Adiwar.**—Is a small field of coal, which is now abandoned.

"**Passer.**—Is a small field of coal, which is now abandoned.

"**11 sq.**—Is a small field of coal, which is now abandoned.

NORTH-WEST
PROVINCES.
1419

COAL.

Coal-fields of India.

"*Umari*—This field is more conveniently situated as regards railway communication, and is that where successful workings have lately been established, and good coal obtained that gave excellent results. This field, with a proved area of about 3 square miles, and an estimated amount of its command-
on the East
supply of the

and a thick seam of good coal has been proved. } square miles,

"*Jhilmili*—Is another area of about 41 square miles, in which seams of some promise have been observed.

"*Bisrampur*—Has an area of about 400 square miles occupying the central basin of Sarguja; it contains some good coal suitable for locomotives.

"*Lakhanpur*—South of the Bisrampur area, holds some seams of good

CENTRAL
INDIA.
1420

in the Mahanadi valley.—
an area of at least 1,000
square miles; some of the seams are very thick, two being respectively 90 and 163 feet; but though including good coal they often contain a large proportion of shale, and the horizontal extension of the seams is sometimes irregular and uncertain. These fields will probably assume importance in connection with the line to connect Calcutta with the Central Provinces. The recent boring experiments show that the Korba area has proved most worthy of consideration, particularly at Ghordewa, 9 miles to west-north-west of Korba, where there is a 5-foot seam of good coal.

CENTRAL
PROVINCES.
1421

"*Satpura Basin, south of the Nerbada Valley*.—The *Mohpani* field is of importance in consequence of its position with reference to the Great Indian Peninsula Railway (95 miles by rail, west-south-west from Jabalpur). The coal is worked by the Nerbada Coal Company and supplied

field

are of

age of
ains

HYDERABAD.
1422

three seams of coal, with a maximum total thickness of 30 feet.

"*Wardha (or Chanda), &c*—Includes, with several other areas, Sasti and Paoni in Hyderabad, in which coal has been proved to exist. There are about 1,714 million tons of coal available, viz :—

Warora basin	14	} million tons.
Ghugus	45	
Wun	1,500	
Between Wun and Papar	50	
Between Janara and Chicholi	75	
Sasti and Paoni (Nizam's territory).	30	

The only pits worked in this wide area are at Warora, whence a special branch line conveys the coal to the Nagpur branch of the Great Indian Peninsula Railway.

"*Cutch*.—There are a few thin shaly seams at Trambal (Tromba or Trombow), about 5 miles north-east of Bu, in a stream north of Sis-agad, and in a stream west of Guneri near Lakhpat. Besides these jurassic seams, there are some tertiary carbonaceous layers of no promise

BOMBAY.
1423

COAL.

Coal-fields of India.

CENTRAL
INDIA
1420

"*Umaria*—This field is more conveniently situated as regards railway communication, and is that where successful workings have lately been established, and good coal obtained that gave excellent results. This field, with a proved area of about 3 square miles, and an estimated amount of 28 million tons of coal, is of great importance on account of its commanding geographical position (34 miles from the Kaini station on the East Indian Railway), and its being the nearest source for the supply of the North-Western Provinces and the Panjab.

"*Korar*—Three miles north of Umaria. The area is 9 square miles, and a thick seam of good coal has been proved.

"*Jhimli*—Is another area of about 41 square miles, in which seams of some promise have been observed.

"*Bisrampur*—Has an area of about 400 square miles occupying the central basin of Sarguja, it contains some good coal suitable for locomotives.

"*Lakhanpur*—South of the Bisrampur area, holds some seams of good coal, the area is 50 square miles.

"*Raigarh, Hingir, Udaipur and Korba* fields in the Mahanadi valley.—With the other associated rocks, these occupy an area of at least 1,000 square miles, some of the seams are very thick, two being respectively 60 and 168 feet, but though including good coal they often contain a large proportion of shale, and the horizontal extension of the seams is sometimes irregular and uncertain. These fields will probably assume importance in connection with the line to connect Calcutta with the Central Provinces. The recent boring experiments show that the Korba area has proved most worthy of consideration, particularly at Ghordewa 9 miles to west north west of Korba, where there is a 5 foot seam of good coal.

"*Sitapura Batin, south of the Nerbada Valley*—The *Mohpuri* field is of importance in consequence of its position with reference to the Great Indian Peninsula Railway (95 miles by rail, west south-west from Jabalpur). The coal is worked by the Nerbada Coal Company and supplied to the railway, but the supply falls short of its requirements.

"*Shahpur (or Betul)* on the south of the Tawa valley—This field contains seams of irregular thickness and inferior quality.

"*Pench Valley*—There are many coal seams, some of which are of considerable thickness, and the coal often of fair quality.

"*Wardha-Godavari Valleys*—The *Bandar* field—near the village of Chmur, 30 miles north-east of Warora in the Chanda District, contains three seams of coal, with a maximum total thickness of 38 feet.

"*Wardha (or Chanda), &c*—Includes, with several other areas, Sasti and Paoni in Hyderabad, in which coal has been proved to exist. There are about 1,714 million tons of coal available, viz.—

Warora basin	14	} million tons
Ghugus	45	
Wun	1,500	
Between Wun and Papur	50	
Between Janara and Ch choli	75	
Sasti and Paoni (Nizam's territory)	30	

The only pits worked in this wide area are at Warora, whence a special branch line conveys the coal to the Nagpur branch of the Great Indian Peninsula Railway.

"*Cutch*—There are a few thin shaly seams at Trambal (Tromba or Trombow), about 5 miles north-east of Buj, in a stream north of Sis-agad, and in a stream west of Guneri near Lakhpat. Besides these jurassic seams, there are some tertiary carbonaceous layers of no promise.

BOMBAY.
1423

Coal-fields of India.

(H. B. Medlicott)

COAL.

SIND.

1424

TRANS INDUS

1425

"*Shahrig* — On the Harnai route, there are outcrops of several thin seams of tertiary coal, none being 2 feet thick, while the greater number are under 6 inches. Some of the coal is of fair quality and would be useful for local purposes. The latest reports give a 6 foot seam of coal near Kosht; but the dip is said to be as high as 45° which will militate greatly against its profitable extraction.

"*Chamarlang*, in the Luni Pathan country, about 75 miles from Dera Ghazi Khan — There are several seams of tertiary coal, of which the

am of tertiary coal
also said to occur
Hissarlik), and at

containing coal.

"At Kalabagh nummulitic coal exists in very small quantities in the alum shales, the so-called Kalabagh coal consists of carbonized wood in a bed of jurassic shale, of which it forms $\frac{1}{10}$ th to $\frac{1}{15}$ th part or less.

"*Salt Range proper* — Nummulitic coal is found at Amb (or Umb), Sungrewar, Chamul, Kutta, Sowa Khan, Deival, Nurpur (Nilawan), and

PANJAB,

1426

spect of being profit-
such coal is seen at
The later develop-
communication, has

s rapidly approach-
ing completion, and promises, notwithstanding the thinness of the seam,
and the friable and pyritous condition of the coal, to be a fairly remuner-

in places. As the locality is near a good road a fair amount of fuel might be obtained, for the coal contains less pyrites than elsewhere. At Bhaganwalla, the outcrop of the seam is 3 feet 6 inches and extends for 2 miles, the coal is much cracked and jointed and contains much pyrites. By means of suitable workings good masses of bright coal might be obtained, and though the locality is difficult of access, it might be improved in this respect. The available coal is estimated at 16,20,000 maunds (60,000 tons).

"*North-West Himalayas* — At Dandli, near Kothi, on the Punch, and at the north-west shoulder of the Sangar Marg Mountain, there are beds of nummulitic coal, the position of which, however, seems to preclude the possibility of successful exploitation. The latter field has been recently examined, and seems to hold out a fair prospect of success.

HIMALAYAN,

1427

"Coaly matter and lignite occurs sparsely in the Sivalik sandstones of the sub-Himalayas, and has frequently given rise to false hopes of the discovery of workable coal in these regions. There is, however, no probability of such being met with.

"*Sikkim* — There is a coal-field in the Darjiling District which occupies a narrow zone stretching along the foot of the Himalayas from Pankajari

COAL.

Coal-fields of India.

ASSAM.
1428

to Dalingkote, the coal is of Gondwana age and is much crushed, some of it is in the form of a powder, and has assumed the character of graphite.

"*Nalla Hills*—A seam of Gondwana coal, 5 to 6 feet in thickness, is probably never possess any economic value.

Carbonaceous and nummulitic coal occurs, but the basins are situated there are great difficulties in getting the coal to market. The

470,000 tons. In the Jaintia Hills, exist at five localities, viz., Am-ur, and Shermang. At La ka-dong it is irregularly developed, but its amount is estimated at 1,500,000 tons.

"*Garo Hills*—The Daranggiri coal-field (cretaceous) contains a 7-foot seam of coal, favourably situated for working, but at present useless for want of access.

"*Upper Assam*—There is an important field at Makum which is being worked by the Assam Trading Company, it contains several seams of coal, one of which is over 100 feet thick, 75 feet being good coal. The beds are disturbed and the coal seams lie at an average angle of about 40°, so that some difficulty may be met with in working them. An approximate estimate gives 18,000,000 tons as available, supposing the workings to be nowhere carried more than 200 yards from the face or 400 feet to the deep.

It is the best coal for the most part, and the workable seams are estimated to be what may be

of poor quality. Some of the seams in this field are of and over, the estimated quantity available

is 10,000,000 tons.

"*Fanjy and Disas*—Two small and unimportant fields in Upper Assam.

BURMA.
1429

"*Arakan*—In the Arakan Division, at the Baronga Islands, on the western coast of Angara Khyong, about 2 or 3 miles from its southern

Tsetama, two seams occur, one of which has a thickness of 4 feet, the other of 2 feet 5 inches. A 2-foot 6 inch seam of similar coal occurs on the Cheduba Land.

"*Pegu*—Coal was discovered in 1855, and a mine opened at Thayetmyo, but after a few cwts had been extracted, the work was abandoned on account of the seam dying out. Further explorations have been recently carried out. At Dalhouse, near the mouth of the Bassein river, and in other places, traces of lignite, which have at times given rise to

In the Myanourng al occur py rocks at a number of localities, those at which the coal may possess a possible value are Thoo-hte-khyong (or Thatay Kyoung) on the Great Tenasserim river, where a mine was formerly worked by Government but subsequently

Coal and Coal-mining in India.

(H. S. S. S.)

COAL.

abandoned. This seam was 11 feet 8½ inches thick, of which 6 feet 8 inches were true coal. At Hienlap (or Hienlat), about 6 miles from the last locality, there is a seam from 17 to 18 feet in thickness, and the coal is of pretty uniform character with conchoidal fracture. Three quarters of a mile main seam being river, at A-Tong-

an irregular bed varying from quality is such that it found in my purposes.

ingadaw (on the western banks The most southerly is 10 the seam is and rapidly on the upper yadaw. The

like resin. The thickness is 3 feet 9 inches to 4 feet; both floor and roof are good. On the Chindwin river near Kalewa is a 10-foot seam of cretaceous coal; it is well situated for transit purposes. On the Paulwing river there are numerous irregular thick seams of tertiary coal.

"In the Andaman and Nicobar Islands coal is known to exist; but so far as they have been examined there are no grounds for belief that a valuable deposit of coal occurs. (See *Manual of the Geology of India, Part III.*)

ANDAMAN.

I430

INDIAN MINES.

I431

Indian coal up to present date:—

INDIAN CONSUMPTION OF COAL.—"The coal and coke used in India are either imported or raised and made in the country. The foreign sources of coal and coke supply are Europe, Australia, and Africa. Taking coal first, the proportion of coal raised in the country and that imported is as under—

I432

	Tons.
Imported (1883-84)	678,000
Raised in India (1884) about	1,556,400
	2,216,000

"The value of the former is stated to be Rs. 1,09,96,047. The value of the latter at the pit's mouth may be taken at Rs. 38,45,000. The imported coal is chiefly large or steam coal. The marketable coal raised may be taken at 1,200,000 tons yearly, the balance being either used as coke or allowed to go to waste. Of the marketable coal the largest proportion is steam and rubble which are used on railways to a large and in steamers

* See page 388.

COAL

Coal and Coal-mining in India

1433

to a smaller extent. The small kinds of rubble or smithy are used in stationary engines for smithy purposes, brick burning, and lime-burning.

"The quantity of Indian coal used on railways in 1884 was 436,804 tons, the quantity of imported coal being 197,342 tons. The imported coal is used on railways unfavourably situated as regards Indian coal fields.

QUALITY OF INDIAN COAL.—"The quality of Indian coal varies much. Below is a table of ultimate analyses of specimens from Karharbari and Raniganj coal-fields with analysis of English and Welsh coals for comparison:—

COAL-FIELD	Carbon	Hydrogen	Oxygen and Nitrogen	Sulphur	Ash	
Karharbari	78.20	4.34	7.89	0.42	9.15	Main Seams Upper Seams
E. I. Railway	70.93	4.10	12.49	0.52	11.96	
Raniganj (N. B. Coal Co.)	74.31	5.12	9.67	0.47	10.43	
England { Newcastle	82.33	5.32	7.13	1.17	3.55	
{ South Wales	83.47	4.59	3.02	1.25	3.09	

"It will be noticed that in several particulars Indian coal is inferior to English, *1st*, in containing more ash, and *2nd*, less carbon and hydrogen.

"In the table below the commercial analyses of many Indian coals by the writer and Mr. T. H. Ward F.G.S., are given, as also commercial analyses of Newcastle and Welsh coals, for comparison.—

COAL-FIELD.	Spec. gravity	Ash	Fixed carbon	Volatile matter	Sulphur	Heat ng. power by Thomson's calorimeter	REMARKS.
BENGAL { Karharbari { Lower seam	1.35	9.13	66.84	24.00	0.42	13.20	Not worked
{ Upper seam	1.33	11.96	60.46	27.59	0.52	12.50	
{ Raniganj { Al pore (average)	1.389	14.63	60.86	20.81	1.26	12.89	
{ Barakar	1.327	7.27	64.26	27.63	1.56	13.69	
{ Dhadka		7.64	49.61	42.75			
{ Borra		10.03	60.70	29.27		12.33	
{ Belrooa		9.59	53.70	36.75		12.40	
Tindaria		27.68	65.22	7.10			
CENTRAL { Umaria coal field	1.439	16.03	71.77	12.20	Trace		
PRO- (1885)							
VINCES { Jhilla (1882)		13.55	57.95	28.50			Not worked
{ Warora (average)		8.99	42.85	48.16	0.849		
Burmah coal (Murray Coal Co.)	1.390	13.36	50.00	36.44	7.86	13.06	
Assam		1.60	53.42	44.98	2.52	13.99	
Welsh	1.312	3.68	82.66	13.66	1.59		
Newcastle	"	3.49	83.25	13.6	1.07		

"The above table shows that there is great diversity in the chemistry of the coals of India and the variations in physical features are just as marked. With the exception of Tindaria and Assam coal, all Indian coals are remarkably laminated in structure, the laminae consisting of a dark highly

Coal and Coal-mining in India.

(W. Saise)

COAL.

has a very peculiar fracture and breaks into small pieces. Other Indian
"Warora coal breaks like shale

Karharbari and Raniganj

the coal of Karharbari,
although behind the
behind the Newcastle

coals, and are much of the same character, possessing a large percentage of
volatile matter.

COMPARISON OF INDIAN WITH IMPORTED COAL FOR RAILWAY PUR-
POSES—"The Indian and imported coals have been tried on Indian Rail-
ways with the following results:—

1434

EAST INDIAN RAILWAY.

COAL.	Gross weight of trains	lb per mile of coal consumed	lb per ton mile.
	Tons cwt.		
Karharbari	207 19	30 12	'145
Raniganj Sanctoria	212 17	32 21	'151
" Equitable	208 1	33'68	'161
" Ordinary	204 14	36 08	'181
North Wales	215 9	31 00	'148
South Wales, Cardiff	203 11	32 64	'160
New South Wales	207 14	31'42	'151

D. W. CAMPBELL,

Locomotive Supdt, East Indian Railway.

COAL.	Gross weight of trains	lb per mile of coal consumed	lb per ton mile.
	Tons cwt.		
Karharbari	166 12	25'76	'155
Raniganj	181 7	33 33	'184
Barakar	170 3	30 04	'177
Fothergills (S W)	183 12	30'45	'165
North Wales	174 9	27 12	'156
Australia	150 4	27 43	'133
Duckenfield			
Merthyr			
Godavari	171 12	33'48	'176

F. H. TREVETHICK,

Locomotive Supdt., Madras Railway.

COAL.

Coal and Coal mining in India.

"It will be seen from these results that Karharbari coal is a good steam coal, little inferior to imported coals, and that the other Indian coals (except Godavari) are of fair quality. Umaria coal, tried on the Great Indian Peninsula, gave 42 63lb per train mile with a gross load of 410 tons. This is nearly but not quite as good as Karharbari coal.

INDIAN PRODUCTION.—"The sources of Indian coal supply and the estimated yearly output are as under—

CENTRAL PROVINCES	{ Warora	:	100 000
	{ Nerbada	:	23 000
	{ Umaria	:	7 290
BENGAL	{ Karharbari	:	500 000
ASSAM	{ Raniganj	:	8 70 000
			50 000
			<hr/> 1,525,000

As the newer fields develop this estimate will have to be increased.

DISTRIBUTION OF INDIAN SUPPLY.—"The Warora coal-field is connected with the Nagpur branch of the Great Indian Peninsula by the Wardha Coal State Railway, the Mohpani (Nerbada) coal field by a branch from Godavari with the Great Indian Peninsula. The Umaria coal-field has been tapped by the new line from Kurni through the East Indian Railway, Jubbulpur line. The Assam coal field is connected with the Brahmaputra river by a line from Dibrugarh.

"The coal from the collieries of the Central Provinces is used on the following railways: Great Indian Peninsula, Ryputana Malwa, Wardha Coal State Railway, and the Nagpur-Chattisgarh, the smaller coal going to mills.

"The Bengal coal finds its way to the Panjab railways and the railways of Bengal, as also into the manufactories of Calcutta and the large cities along the line of railway. Some is used in the steam ship lines. Small coal is largely employed for brick making. Comparatively little is utilized for domestic purposes. The Colliery Companies should endeavour to create a want by teaching the people how to use small coal in large towns, such as Allahabad instead of wood and cowdung. Agencies like those in English cities could probably do this in a few years, and the large waste of small coal that goes on at present would thus be obviated.

1435

MINING IN INDIA

"Has made considerable progress during the past few years, machinery and well-appointed heapsteads and pit frames are coming generally into use.

"In most cases the railway is brought close to the mines, and where this is difficult, tramways of various gauges, worked by locomotives, carry the coal from the mine to the railway wharves.

"The seam is generally shallow, and engine-inclines or shallow pits give outlets for the coal. The two deepest mines in India are 230 shaft of the East Indian Railway Karharbari collieries, Bengal, 429 feet deep and the Helen Pit of the Nerbada Coal and Iron Company, Central Provinces, which is 402 feet deep.

"The system of working varies very much. At Warora, Central Provinces, where 100 000 tons per annum is wound by direct acting engines out of two shafts 200 feet deep, the system most nearly approaches the

* It may be noted that it is the marketable coal that appears in the Government returns, not the actual amounts raised. In 1883-84 these were 1,200 957 tons. Conf with p. 385.—Ed.

Coal and Coal mining in India

(11th Series)

COAL

English No women
day morning to Satu
shifts of 8 hours each
thus Galleries or bo
in height, leaving the roof coal, and pillars 40 feet square. The coal is
so hard, it has to be nicked and undercut and then blasted down. The
pillars are worked by splitting each from one headway to another and
then taking the far end off in slices. The roof coal comes with it.

"At the Mohpani collieries a similar system is worked. The difficulties met with in these mines, owing to the faulted and disturbed nature of strata, are probably unequalled in India.

Karharbari coal field — 'Is the smallest field in Bengal. It is mainly worked by three Companies—the Ranigunge Coal Association, the Bengal Coal Company, and the East Indian Railway. The mines are connected with the main line wharves by metre gauge or 2 feet gauge lines worked by locomotives. During the busy season the coal-field presents a scene of great activity. As much as 50,000 tons of coal and coke have been raised and despatched in one month. The coal-field is connected with the East Indian Railway Chord line by a branch from Madhupur to Giridi, the terminus or colliery station. In mechanical arrangements for raising coal, this coal field is well advanced. The old fashioned gin is almost obsolete and bullock carts have little to do.

"The system here is similar to that obtaining all over Bengal. The working hours are from 6 A.M. to 6 P.M., and perhaps later when extra

work with him, carrying or training his coal. Picks of English pattern and make are now universal, the crowbar and single pick having been ousted. The workings are on the bord and pillar system. Pillars vary from 12 feet to 40 feet square and 40 feet X 60 feet. In the shallow mines

ams
eam
r in
hock
the
front side. When pillars are taken out the chocks are withdrawn and the roof falls.

"The remarks on the Raniganj coal field given below apply in some measure to the Sankar coal field.

and Kols. There are some local men how to cut coal have discarded the Bauris.

the Bauris are not in such requisition as formerly.

"Drainage is effectively carried out by Tangye's special and lifting and forcing pumps, worked by bob-levers from horizontal engines. The machinery is of good type, and winding and hauling are done by good engines.

"Ventilation is attended to in the deep mines, mainly by furnaces or steam-jets.

1436

COAL.

Coal and coal-mining in India.

brick. huts of mud walls of room. huts consist of one Those better off have cowsheds and granaries; these two latter with the dwelling forming three sides of a quadrangle. The larger proportion of the labourers cultivate during the rainy season and work at the collieries only in the cold and hot season, say from October to June. Some of the labourers have settled down to coal-cutting as a calling, and these work constantly, always excepting Monday, which is invariably a holiday.

"Coal-cutting is paid for by contract, at so much a tram or bucket; these

At the tram:

"A the air Railway smithy for smiths' forges, &c., is also made to a large extent, about 7,000 tons per annum being the outturn.

"The following notes on the Raniganj coal-field are by Mr. T. H. Ward:—

"The Chord line, East Indian Railway, passes across this coal-field, and the collieries are clustered on either side and along the Barakar branch.

which they sang as they tramp round and round.

"The sinking in the district is easy, through sound sandstones, no brickwork being required to protect the sides. Heavy water is sometimes met with.

"The coal in the east of the field is very strong and non-caking. The sandstone roof is also very strong and comes right down into the coal. Practically no timber is required in working the coal in the manner described below. In the west of the field at Sanktoria, for instance, the coal is not so strong, though the roof is everywhere the same. From Belroie, near Sitarampore, westwards, the seams worked are all coking coals.

"The seams worked are seldom less than 10 feet and sometimes reach 18 feet in thickness. In the Barakar Coal Company's Komerdohi colliery and the Bengal Coal Company's Liakdi colliery on the west of the Barakar, the enormous thickness, of upwards of 80 feet, has been found. This seam has, up to the present, only been quarried at its outcrop. It

with reference to the prejudicial

Coal and Coal-mining in India.

(II. Saite)

COAL.

considerations. Galleries are excavated to the full height of the seam 12 feet to 16 feet in width, leaving square pillars of varying sizes to support the roof, many acres being thus often left on pillars. The native coolie insists (and he has his own way very much in this coal-field) on commencing operations at the roof and working downwards until the full height of the seam has been excavated. His chief and dearly-prized weapon is a 'sabai' or crowbar with a sharp point at one end. With this he smashes the coal, standing always when at work. He never grooves beyond the first 'cleat'; gangs of 4 or 5 men occupy each gallery; they are paid by the bucket or tram of steam coal or small delivered at the pit bottom. If any timber has to be set in a working place, a man of the carpenter caste (*Chūlar*) who is paid a daily wage must be sent for the purpose.

Women and children work underground, and are principally employed in carrying the small coal and dust. They are also paid by the

Access to the mines is very generally by inclines opening to the surface.

In the eastern part of the district the seams are for the most part flat, in the central and western parts the strata are often steep (the general rule being that the strata become more steeply inclined the further west they are).

A mine (west of the Barakar) belonging to the Bengal Coal Company was abandoned some years ago after an explosion in which several men were burnt, some of whom died. At Sanktoria, also belonging to the Bengal Coal Company, some men were burnt in 1883.

The quarries at Komerdobie and Liakdi have already been mentioned. Thousands of tons of coal have been won from the outcrops

on Mondays. For the rest he is good tempered and improvident. It is a difficult matter to persuade him, although he is always paid a 'ticea' (contract) rate for his work and could easily increase his earnings, to do more than will, with his wife's contribution, keep the household 'in rice' and himself in drink for the day. The nearly universal and very bad custom in this district is to pay each evening for the work done during the day. The collier or cooly has often to wait about until 8 or 9 P.M. for his money. He then goes cheerfully home and remains up half the night in his room, drinking and smoking. He then goes to bed, and the next morning he gets up at daybreak, and goes to work.

He gets up at daybreak, and goes to work. He cuts. Every morning he draws at the godown sufficient for his requirements during the day, and an allowance of cotton thread or old rags to serve for wick. This oil he burns in a 'chūrag' or small piece of stone hollowed out into the shape of a boat (a piece of tile from the roof of his house is often substituted). In this he places a small quantity of oil and

COAL.

Trade in Coal

a portion of wick Any oil he can save from his 'allowance' is his perquisite and he can carry it home Mohawa and castor are the chief oils used Some of the mines are lighted by kerosine, burnt in small tin lamps, holding about 2 ounces with small circular wicks The native does not

tion

a

T

is in question, and he has besides helped much to prevent ventilation becoming a necessity by the wonderful power of endurance he has shown This power of endurance enables him to work for hours at the bottom of a sinking shaft with water pouring over his naked body or to work all day long and day after day under a free galley of feet from any air steam This want c

and ought to be speedily remedied

1438

GENERAL CONCLUDING REMARKS BY DR SAISE —The coal industry in India employs about 30,000 persons, the quantity of coal raised per annum per person employed, surface and underground, being 51 tons

"In Europe the numbers are different, varying with the thickness of seams and nature of difficulties met with

England (average)	348 tons per person employed under-ground and surface per annum
Belgium	134 Ditto
Saarbrücken	187 Ditto

There is no Government regulation of the coal industry, any person can manage a mine on any system he likes, whether or not he has experience or training Interest has a great deal with the appointment of the managing staff, and it is to be feared that the best is not made of the splendid coal deposits the favourable roof, and the moderate depths and inclinations of the seams"

TRADE IN COAL

1439

The following brief note prepared by the Revenue and Agricultural Department

in India may be estimated at two million tons of which three-fourths of a million tons are imported from the United Kingdom and one and one fourth million

the amounts of fuel consumed by the 1885 to 1887 as given in the last Rail

YEAR	COAL		Coke	Patent Fuel	Wood
	English	Country			
	Tons	Tons	Tons	Tons	Tons
1887	212 529	479 219	9 564	30 029	292 808
1886	240 063	450 94	9 132	26 212	259 513
1885	225 721	476 277	10,439	23 117	253 178

C. 1439

Trade in Coal.

COAL.

In 1886 there were 99 collieries in Bengal (of which, however, 37 were closed), 2 in the Central Provinces, 3 in Assam, and 1 in Umeria in Rewa (Central India), or 105 in all, of which 68 were actually worked. The output was returned as follows —

	Tons
Bengal	1,187,000
Central Provinces	117,300
Assam	70,800
Central India	13,500
TOTAL	1,388,600

Assam has since increased its output, the figures for 1886-87 being returned at 72,000 tons. It is stated in the Railway Administration Report for 1886-87 that—

“Coal continues to enjoy the confidence of the public. Its sale to the river steamers and tea factories is increasing. It has been contracted for by the Dacca State Railway, the Kaunia Dharila State Railway, and the Eastern Bengal State Railway,—b

It is being largely enquired for by the Calcutta, also by the Eastern Bengal and the Northern Bengal State Railway, but the difficulty of access to these two railways from the river Brahmaputra prevents its extensive use by their administrations. The coal continues dusty, though it is being mined deep in the hill sides. But its nature is beginning to be understood, and its friability is not found to be a drawback to its use as a steam fuel.

“The coke is found to be saleable to the tea factories of Lakhimpur to an extent of about 3,000 tons per annum. The Company is preparing by means of an increased labour force to enlarge the output of coal to 100,000 tons yearly.”

Collieries have recently been opened out at Dandot (Panjáb) and Singareni (Nizam's Territory). The coal in these mines has been pronounced of good quality, and in Upper Burma coal has been found (in the Kali Valley on the Chindwin River), but arrangements have not as yet been made to work this new source of supply.

Mr O'Connor, in his review on the Sea borne Trade Returns for 1878-79, gives the following historic sketch of the Indian coal industry,—

“Coal mining in India is rapidly attaining considerable importance. The commencement of this industry appears to date back to 1820, when a mine was opened in the Raniganj district in Bengal. For twenty years no new mine seems to have been opened, and then only three mines were opened down to 1854. In that year the commencement of the East Indian Railway line, which was laid to run through the coal bearing regions of the Damuda basin, gave an impetus to the mining industry and new pits were opened in larger numbers—2 in 1854, 3 in 1857, 3 in 1859, 3 in 1860, 2 in 1861, 1 in 1863, 2 in 1868, 1 in 1869, 1 in 1870, 2 in 1871, 1 in 1872, 3 in 1873, 7 in 1874, 5 in 1875, 3 in 1876, and 5 in 1877. All these were in Bengal in the Raniganj and neighbouring districts, which contain now altogether 56 mines at work. In the Central Provinces also the coal fields of Narsingpur and Chanda have been utilized for the purposes of the Great Indian Peninsula Railway.”

In the paragraph above the number of mines in 1886-87 is stated to have increased to 105.

FOREIGN TRADE.—The total imports into India of coal (including coke and patent fuel, of which a small quantity is received) have more than

FOREIGN
TRADE
1440

COAL.

Trade in Coal.

doubled themselves since 1866-67, having risen from 311,000 tons, valued at Rs5 lakhs, in that year to 765,000 tons, valued at Rs30 lakhs, in 1886-87. The United Kingdom supplies nearly all the imported coal, though Australia, which ranks next to it as a source of supply, is now sharing more largely in the imports, the value of its consignments in 1886-87 being Rs4.75 lakhs against Rs1.10 lakhs in 1866-67. Most of the imported

coal is for steamers on their return journey from India and for the cotton mills in Bombay, which are too remote from the Indian coal-fields to take advantage of them. The percentage taken by each province in these imports is noted on the margin.

INTERNAL TRADE—Statistics may now be given regarding the internal movements of coal by rail during 1886-87 between the different blocks (i.e., provinces, chief towns, and Native States). The total trade amounted in quantity to 1,097,800 tons and in value to Rs15.83 lakhs. The position of each block as a net exporting or importing centre may be thus indicated—

Exports.	Tons.	Imports	Tons
Bengal	743,000	Calcutta	504,000
Bombay Town	162,000	Bombay Presidency	162,000
Central Provinces	41,000	North Western Pro- vinces and Oudh	161,000
Karachi	7,000	Rajputana and Cen- tral India	66,000
Assam	4,000	Punjab	35,000
Madras Town	7,000	Berar	23,000
Madras	1,000	Sind	5,000
		Mysore	4,000
		Nizam's Territory	3,000

As might be expected, Bengal, where the most extensive mines in India are situated, takes the lead among the exporting centres. Of its exports, Calcutta took last year 68 per cent, the North Western Provinces and Oudh 22 per cent, Rajputana and Central India 16 per cent, and the Punjab 4 per cent. The consignments from Bombay Town which consist mostly of English coal, are conveyed principally to the presidency mills, the balance of the foreign imports being used by the shipping and the town mills. The exports from the Central Provinces go to Berar and the Bombay Presidency. Calcutta the North Western Provinces and Oudh, and the Punjab virtually receive their entire supplies from the Bengal mines. Rajputana and Central India draw their largest supplies from Bengal. Berar imports its coal mostly from the Central Provinces, Sind from Karachi, Mysore from Madras and the Nizam's Territory from Bombay Town.

The development of the coal industry in India is indicated by the fact that the gross exports from Bengal to other provinces and Calcutta have increased from 641,807 tons in 1882-83 to 755,831 tons in 1886-87, and those from the Central Provinces from 26,451 tons to 56,125 tons during the same period. Assam for the first time shows a net export (4,000 tons), in referring to which the Director of Land Records and Agriculture writes—“This is entirely due to the increased output of the Makum coal-mines near Dibrugarh, which now supply nearly all the coal used in the Assam Valley, besides furnishing large quantities for export.”

Coke. (A note contributed by Dr W Saise.)

“Coke is imported and also made in India. In 1883-84 the imports amounted to 16,700 tons valued at Rs10.738. Coke, however, is now made to a very large extent in Bengal. It is a most important industry in

INTERNAL
TRADE
1441

1442

COBALT.

Source of Cobalt.

This substance is generally known as Cobaltite. In the *Rajputana Gazetteer*, and in the *Fury Reports* of the Exhibition of 1862, occur accounts of the Jeypur enamels, but in a recent publication, Dr T. H. Hendley (*Journal of Indian Art*), gives more precise details. Sir George Birdwood (in his *Industrial Arts of India*) under Enamels (pages 165-168) and also under Pottery (pages 301-324), gives most instructive particulars regarding the Indian uses of Cobalt. He states, "The *rita* or *saffre* is the black oxide of Cobalt found all over Central and Southern India, which has been roasted and powdered, mixed with a little powdered flint" (p. 308). Mr Ball says, while speaking of the Jeypore blues in enamelling, "The production of the colours was a secret only known to certain families, except as regards the different shades of blue, which are stated" "to be produced by an oxide of Cobalt. This oxide is doubtless prepared by roasting the Cobaltite." The various authors who have described Cobaltite, in the Records of the Geological Department, seem to be unanimous in their opinion that Cobalt is only rarely met with in India, and that, too, in the mines of Rajputana alone (as far as peninsular India is concerned), and that the oxide is artificially prepared, in other words, that it does not occur naturally in Central and Southern India. The art of producing a rose colour enamel on gold with cobalt seems still to be a secret with the *minakars* or enamellers of Jeypore. Cobalt minerals are also said to occur in two other localities—Nepal and Burma.

Economic Uses.—Under the head of "Clays used for Pottery" (C 1333) will be found some account of the uses of cobalt in the ceramic industry while in the above remarks reference has been made to the nobler art of enamelling. In a work specially dealing with economic products, it is perhaps unnecessary to enter at greater detail into a substance the uses of which are so intimately associated with the higher branches of Industrial Art. Dr. Hendley says that the colours used by the Jeypore enamellers "are obtained in opaque vitreous masses from Lahore, where they are prepared by Muhammadan *manihars* or bracelet makers. The Jeypore workmen state that they cannot make the colours themselves. The base of each colour is vitreous and the colouring matter is the oxide of a metal such as cobalt or iron. Large quantities of cobalt are obtained from Bhagore near Khetri, the chief town of a tributary State of Jeypore, and are used in producing the beautiful blue enamel." In these passages Dr. Hendley does not make it quite clear whether the Jeypore enamellers prepare their own material for the blue colour, though unable to prepare the other colours, or whether the entire mass of the crude material is conveyed to Lahore and other centres to be prepared and returned in its manufactured condition to the Jeypore workers in enamel. He, however, proceeds to state that "the known" can be applied to gold. Black, green, and a peculiar salmon colour, can be used.

of white, black, and applies

to the :

The pure ruby red is encased workmen who can bring out its "factures in N. Ind.) gives some details regarding which he divides into two sections, viz., the makers of glass bangles, and the makers of the bangles. Baden Powell (*Panjab Manufactures*) discusses the Multan enamel industry and furnishes particulars regarding the *Mind* blue vitreous enamel. In the *Multan Gazetteer* (p. 107) this subject is enlarged upon, and reference is also made to the Bahawalpur enamels, where, in addition to opaques, a semi-translucent sea green and also a dark blue are produced.

Cocculus

COCCULUS
villosus

In Europe Cobalt is largely used as a pigment and to colour ordinary glass

Coccinia indica, *W. & A.*, see *Cephalandra indica*, *Nand*, *CUCURBITACEÆ*

COCCULUS, *DC*, *Gen Pl*, *I*, 36, 961.

1447

[*PERMACÆÆ*

Cocculus cordifolius, *DC*, see *Tinospora cordifolia*, *Miers*, *MENIS-*

C. indicus (see *Flück and Hanb*, *Pharm* p 31), a commercial synonym for *Anamirta Cocculus*, *W & A*, see *Vol. I.*, *A* 1037.

C. Leæba, *DC*, *Fl Br Ind*, *I*, 102

1448

Vern — *Ullar*, *ullar billar*, *parmatti*, *vehr*, *Ps*, *Ullar billar*, *SIND*

References — *Gamble Man Timb*, 11 *Brandis*, *For Fl*, 9, *Stewart*, *Pb Pl*, 6 *Aitchison*, *Cat Pb and Sind Pl*, 3, *Murray*, *Pl and Drugs*, *Sind*, 38

Habitat. — A large climber of the dry and arid zones, especially of Western India, the Panjab, Sind, and the Carnatic

Medicine — *Stewart* says the stems often become as much as 3 or 4 feet in girth. It is used in Sind and Afghanistan in the treatment of intermittent fevers and as a substitute for *Cocculus indicus* (*Murray*, *Dymock*)

MEDICINE.
1449

Food and Fodder — In the Trans Indus, *Stewart* says, it is browsed by goats but by no other animals. Said to be used as a partial substitute for hops in the manufacture of Indian beer (*Murray*)

FOOD and
FODDER
1450
Hop
Substitute.
1451

C. palmatus, *DC*, see *Jateorhiza palmata*, *Miers*

C. villosus, *DC*, *Fl Br Ind*, *I*, 101

1452

Vern — *Gamli ki bel*, *hier*, *dier*, *HIND*, *Kursan*, *samir*, *SIND*, *Vasana vela*, *MAR*, *Bassangel*, *parael*, *BOMB*, *Kattuk kod*, *TAN*, *Dusari tige chips ru tige*, *kalle-tige*, *Tel*. In the Concan the Vaidis give this plant the Sans name of *Vanalilika*

This plant sometimes bears the name *Farid-but* (a name which more correctly, should be applied to *Pedaltum Murex*, so called in remembrance of the fact that *Shaik Farid Shakar-gunj* is supposed to have lived on water rendered mucilaginous by the leaves of that plant having been shaken in it). This same property is possessed by the leaves of *Cocculus villosus*

References — *Gamble*, *Man Timb*, 11 *Roxb Fl Ind*, *Fd C B C*, 732, (under *Menispermum hirsutum*, *Willd*), *Drury U Pl*, 145 *Dymock*, *Mat Med W Ind*, 2nd Ed., 32

Habitat — A large climber of the dry and arid zones, Sind, Panjab, Deccan extending into Madras and Bengal

Medicine — "The JUICE of the LEAVES, mixed with water, has the property of coagulating into a green jelly like substance, which is applied externally by the country-people under various circumstances on account of its cooling nature, and is also taken internally, sweetened with sugar, as a cure for gonorrhœa" *Roxburgh* says: "A decoction of the fresh roots, with a few heads of pepper, in goats' milk, is administered for rheumatic and old venereal pains, half a pint every morning is the dose. It is reckoned heating, laxative, and sudorific" By more recent writers the root is said to be alterative and to be a good substitute for *sarsaparilla*. *Dymock* remarks that in the Concan the roots rubbed with *Bonduc* nuts in water are administered as a cure for belly-ache in child-

MEDICINE,
Leaves
1453

Roots.
1454

C. 1454

COCCUS
cacti.

The Cochineal Insect.

ren; and in bilious dyspepsia, they are given in 6-mass doses with ginger and sugar; they are also an ingredient, with a number of bitters and aromatics, in a compound pill which is prescribed in fever. The *Pharmacopœia of India* states that this possesses the bitterness and probably the tonic properties of *gulantha* (*Tinospora cordifolia*). Stocks alludes to this as a Sind drug under its native name of *zamis*, and remarks that it is

FOOD.
1455

by patients under . . . If suffered to stand for a few minutes, the jelly clears, "the gelatinous or mucilaginous parts separate, contract and float in the centre, leaving the water clear like Madeira wine, and almost tasteless." (Roxb) With regard to this property the remark under the vernacular name *Furid-billi* should be read. In Eastern Bengal the writer repeatedly observed the milkmen carrying milk to market with a few leaves of this plant and the spine-like leaflets of the date-palm placed in the vessel. On enquiry he was told these prevented the milk from getting bad through the heat and the shaking to which it was subjected. He has never been able to investigate this point further, but it is probable the leaves of the *Coccus* are added more with the object of thickening the water-adulterated milk. A large amount of the milk brought into Calcutta is regularly preserved or adulterated in this manner. Dr. Dymock alludes to the fact that this plant was eaten during the famine of 1877-78 in the Khandesh district, and that it is always more or less eaten in Kaladgi.

Fodder.—Roxburgh says that goats, cows, and buffaloes eat the plant.

Domestic Uses.—"The juice of the ripe berries makes a good, durable, bluish purple ink" (Roxb)

COCCUS; Packard, *Guide to the Study of Insects*, 526.

A genus of insects belonging to the Coccidae of the Order Hemiptera. Several species are, by Entomologists, referred to this genus, but two only are of commercial importance,—the one a native of Southern Asia and the other of the

WHILE DO YOU

while the females have 9 jointed antennæ and are covered by a flattened hemispherical scale

1458

Coccus cacti, Linn.

THE COCHINEAL INSECT; COCHENILLE, Fr; KOCHENILLE
SCHARLACHWURM, Germ; COCCINIGLIA, It, COCHINILLA, Sp.

Vern.—Kirmas, BENG, Kirmas, BOMB, Kiranda, N.-W. P., Kirm, PB.

References.—Royle, *Prod Res of Ind*, 57; *Encyclop Britannica*, VI, 97;
Halfour, *Cycl of India*; Latford, *Dyes and Tans of India*, Wardle,
Report on the Dyes of India, Buck, *Dyes and Tans of N.-W. P.*

C. 1458

The Cochineal Insect.

COCCUS
cacti.*Official Papers on Pigments used in India; Crookes, Dyeing and*

Habitat.—The Cochineal insect was first discovered by the Spaniards in Mexico in the year 1518, but it was not made known to Europe until 1523. At first it was supposed to be a seed, but in 1703 Leeuwenhock showed it to be an insect. In Mexico it is particularly abundant in the provinces of Oaxaca and Guerrero. It occurs in many localities in Central America, and for long has been one of the most important articles of export from Guatemala, but it is met with also in South America, and recently it has been found (or perhaps only an allied insect) in the West Indies and in the southern portions of the United States.

HISTORY AND INTRODUCTION.—The immense importance of the trade, early established in this insect, led to efforts for its propagation in other countries, and for many years this has been profitably prosecuted in Teneriffe, the Canary Islands, Java, Algeria, and to some extent even in Spain. According to some writers the best quality now comes from Honduras. The attention of the Court of Directors of the East India Company was directed to this subject by Dr. James Anderson of Madras in 1786. He forwarded to Sir Joseph Banks samples of a dye-yielding insect which was proved to be a species of *Coccus*, but not Cochineal.

HISTORY.
1459

leaves had withered. Captain Neilson, on his arrival at Calcutta, sent

Neilson himself writes, on the 3rd August 1795, that he had the day before seen at the Company's garden near Calcutta about one thousand fine plants covered with the insects, enough to stock all India." (Royle, *Productive Resources of India*, p. 60, published 1840.)

The above passage has been reproduced here as being the earliest and at the same time most complete account of the introduction of the Cochineal insect into India. Without learning the details we are next informed of its having been successfully introduced into South India, but whether from the Bengal stock or through some fresh effort, cannot be discovered. Passing over a gap of 60 or 80 years, numerous writers refer to "the indigenous insect" in such a pronounced manner as to suggest the doubt whether or not Captain Neilson's stock had, during that period, overrun the whole of India and become so completely acclimatised as to be mistaken for indigenous. Even Royle, in the above passage, alludes to the "indigenous *Opuntia*," whereas no member of the family to which that plant belongs (except the *Ceylon Rhopalosiphum*) was known in the world prior

COCCUS
cacti.

The Cochineal Insect

HISTORY

to the discovery of America, and therefore no Cactus can be called indigenous to India. This is more than a quibble as to the correct usage of a scientific term. If the Coccus sent to Sir Joseph Banks, one hundred years ago, was found feeding on a Cactus, it must be regarded as but an earlier introduction than the Cochineal brought to India by Captain Neilson. It therefore seems probable that the Portuguese (or whoever introduced the *Opuntia*) may have intentionally or unintentionally brought the Cactus-feeding Coccus also. In 1848 Dr Dempster addressed a letter to the Governor General of India which afterwards appeared in the Journal of the Agri-Horticultural Society. He there extols the superior quality of the dye obtained from "the native" or "indigenous" insect as compared with the imported "The quality," he says, "of native Cochineal which I found capable of dyeing a certain weight of woollen cloth proves that the indigenous insects contain an amount of colouring matter not inferior to the fine Mexican cochineal." In the same year Dr A. Fleming published an account of the discovery of the Cochineal insect on the Cactus hedges near Gindria in the Panjáb. He writes: "I got satisfactory proof that the Indian cochineal is an article of commerce in the country." In his *Panjab Products* Mr Baden Powell refers to an occasion when the Cactus had increased so rapidly in the Jullunder Doab "as to become a nuisance, and rewards were offered for its extermination which, however, were rendered unnecessary shortly after, as a large number of insects of some kind of Coccus appeared and soon effected the destruction of the plant, which is now only occasionally to be met with."

Mr Liotard (*Memorandum on Dyes and Tints of India*) enters into considerable detail regarding what he calls "the indigenous insect," and Mr McClelland says, "the insects seem to thrive on our own indigenous species of *Opuntia*; but as we have abundance of the South American plant, *O. cochinitifera*, that species may also be tried along with the several sorts of our own."

In all these instances the Coccus alluded to is a cactus-feeding insect, but the *lac* insect, as stated above, belongs to the same genus and it feeds upon many widely different trees (see a further paragraph), but has never been recorded as feeding on the Cactus. From the travels of Lieutenant Burnes and Dr Gerard (see *Journal, Asiatic Society, Bengal, II*) we learn that a species of what they are pleased to call Cochineal was seen to flourish on the roots of a plant growing in a marsh near Herat, but that the natives, instead of using that dye, are stated to import their cochineal from Bokhara and Yarkand. Without speculating too far as to what the Herat cochineal may prove, when thoroughly investigated, it may be here remarked that the Polish cochineal (*Coccus polonicus*) feeds on the roots of a *Scleranthus* found in sandy places throughout Europe. Mr Baden Powell alludes to the Bokhara cochineal as imported into the Panjáb. In numerous official and other publications, trans-Himalayan cochineal is referred to. If this should prove distinct from the cactus-feeding species, it may be found allied to the *Coccus ilias* of Greece, an insect which has long been used as a dye under the name of *kermes chermes*, or *alkermes*. That insect is reported to feed upon a species of oak. The Herat Coccus may, on the other hand, be allied to the *Coccus mangiferae*, Ehrenbergh, which is found in Sana feeding on *Tamarix*, and is supposed to be the cause of the gum like exudation known as Manna.

THE INTRODUCTION OF THE *OPUNTIA* OR PRICKLY-PEAR.—The above remarks may be accepted as disposing of the question of "the indigenous cochineal insect which feeds on the common prickly-pear." If not indigenous then, as an acclimatised insect, has it deteriorated after

Reintroduction of the Cochineal Insect.

COCCUS
cacti.

the lapse of 100 to 150 years? Perhaps the further question may also be suggested—was the insect derived from the best stock? If unfavourable answers have to be given to these enquiries, then it would remain to be ascertained by actual experiment whether an improved and fresh stock could be acclimatised. We shall return to this point later on, but it may

Madras
Cochineal
Plant.
1461

hold that these afford tinctorial principles. They are, in all probability, truly indigenous, and may even be well worthy the attention of commercial experts. A scarlet dye is often alluded to in the ancient writings of

of the first so-called Indian cochineal insects which were sent to Europe, and at the same time the head quarters of the acclimatised *Opuntias*. The sudden appearance and disappearance of a *Coccus* in the Panjáb, mentioned by Mr. Baden Powell, would justify the conclusion that Captain Neilson's insect need not have taken more than a few years

Panjáb
Cochineal
Plant.
1462

take for its eradication more energetic and continuous steps than those hitherto adopted." "The native tradition is, that a few seeds of the

Bombay
Cochineal
Plant.
1463

It has spread in
have become a
the present cen-
"This species of

MODERN EFFORTS TO REINTRODUCE THE COCHINEAL INSECT.

There are commercially two chief kinds of this insect, but whether distinct species, or the one only the wild form of the other does not appear to have been clearly made out. The former (the so-called wild insect)

Grana sylvestris. A voluminous correspondence has ensued since 1795 as to the desirability of introducing the superior quality, which fetches (from its greater amount of the tinctorial principle) three times the price

1464

C. 1464

COCCUS
cacti.

Forms of Cochineal.

paid for the wild insect. As late as 1882, the Madras Government had this subject brought to its attention, and instructions were given that Dr George Bide, O.E., should supervise the experiment. The Agricultural Society of Madras agreed to place at the disposal of Government a small plot of ground for the purpose of this experiment, although that Society does not appear to entertain any high hopes of ultimate success. Dr Bide addressed two letters to the Government refuting the position taken up by the Society, and his opinions and recommendations were accepted by the Government.

FORMS OF COCHINEAL.

It seems probable that the insect alluded to by Dr James Anderson as found in India prior to the arrival of the Rio Janeiro supply, was also the *Grana sylvestris*, hence possibly a certain amount of the confusion that has crept into the literature of this subject—that insect from its American name of "the wild insect" having come to be viewed as wild or indigenous in India. There is no authentic information as to whether the *Grana fina* exists in this country, but it seems probable that the different qualities of the insects found may be due to the existence of breeds or races derived from both these stocks. The want of technical knowledge has prevented Indian writers, on this subject, from expressing a more definite opinion than that a superior or an inferior cochineal was found in certain districts. This would seem to point to the desirability of having a representative series of the insects met with in India collected and scientifically and unctorially examined as the first step towards the establishment in India of a commercial industry. We read of numerous futile attempts to bring about this desired object but of no combined and systematic investigation. As often happens with economic questions, the desirability of establishing a cochineal industry in India has been periodically brought to the attention of the Government, but allowed to lapse into inactivity from many causes, chiefly the transfer to scenes of greater usefulness of the officers who interested themselves in the subject. Dalzell and Gibson, under the heading *Opuntia Tootash, Nil*, say "This is a species on which according to Humboldt and Bonpland the cochineal *Grana fina* is fed, others say that the false cochineal insect only feeds on trees. We have had numerous experiments regarding the introduction of this product. In the new-production-fever years, ranging from 1833 to 1845, sundry attempts were made by the late M. Sundt and others, but after considerable expense incurred, and a heavy amount of correspondence, as usual in such cases, the whole ended in smoke" (*Fl. Bomb. Supp.*, 40).

GRANA FINA AND GRANA SYLVESTRIS—Humboldt was, perhaps, the earliest observer to distinguish "the fine from the inferior or wild sort of cochineal." The former insect he says, is merely, or covered with a white powder, while the latter is enveloped in a thick cottony substance which prevents the wings of the insect being seen. The *Grana fina* is reported to be a native of Mexico, and the *Grana sylvestris* of South America. Dr Balfour remarks "It has been mentioned that at Virgapatam there is a great deal of the red flowering prickly pear on which the cochineal insect feeds, that the insect under propagation at Osmoor (Singapore) has been ascertained to be the true cochineal insect, and to be procurable in several districts in South India, but it only destroys the plants with red flowers and few prickles, and that it will not propagate on the yellow flowering prickly pear of *Opuntia*. I have seen it tried at Belary and Nil." Commenting on this, Mr Liotard remarks (and he has been followed by several more recent writers) "Regarding the future in India, it may be well to lay stress on the statement made by Dr Balfour that

C. 1468

Grana Fina.
1465
Grana sylvestris.
1466

Red-flowered
Opuntia.
1467

Yellow-flowered
Opuntia.
1468

Peculiarities of the Cochineal Insect.

COCCUS
cacti.

the true cochineal insect only destroys the prickly pear plant with red flowers and few prickles, and will not propagate on the yellow-flowered plant or *Opuntia*." Again, "as regards the Peninsular, we learn from Dr. Balfour that not only the *variety* (*sic*) of plant required but the superior *species* (*sic*) of the insect also exists in parts of the Madras Presidency." Although Dr. Balfour's remark as to the existence of the true cochineal insect in Madras has been thus reiterated by other writers, the Madras Government in 1882 decided to make an effort to introduce the

agreed that Captain Neilson's insect, which was found to thrive best on the common *Opuntia*, was the *Grana sylvestris* and not the *Grana fina*. If Balfour be correct in the statement that the latter insect does actually exist in Madras, he may lead to further confusion on the red-flowered plant until it has been decided on the red-flowered cactus is or is not a race derived from the true cochineal insect, perhaps more ancient than Captain Neilson's stock. The position assumed by Mr. Liotard of urging the extended cultivation of

Steps to be

1469

and not the semi-domesticated, has as yet been introduced into India, and that all the opinions he has quoted refer to the plant on which the former and not the latter is able to subsist. It would thus appear that the first and most natural step towards the introduction into India of a commercial industry in cochineal should be the thorough investigation of the races of *Coccus* already existing in the country and the plants on which they feed. Such an enquiry, as already suggested, might lead to the discovery of a race derived from the true cochineal insect, but so degenerated as to fully justify the importation of a new stock. The plant on which the acclimatised insect is found to feed would naturally be that which should be fostered in anticipation of the arrival of a fresh importation. Degeneration, if established, might be accounted for by an originally semi-domesticated creature having been allowed to run wild for a century or more, or from having been forced to feed on the wrong plant. Mistakes may thus be made, but the course indicated would most probably prove the most direct, and it may happen that we possess a long-acclimatised stock which, under careful treatment, would prove more hopeful than any insect that might now be introduced.

PECULIARITIES OF THE COCHINEAL INSECT.—This account of cochineal may therefore be concluded by referring to some of the more striking peculiarities of the insect which have a direct bearing on the question of its propagation. Balfour says: "There are three periods of the life of the

1470

selves to the cactus plant, and from that moment the female is on her hold. A cottony coat grows over her, which falls off at 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

COCCUS
cacti.

Propagation of the Cochineal Insect.

Male.
1471

"The male also adheres to the plant, and in about 12 days becomes engorged in a cottony cylindrical purse, open at the bottom; the insects are dis- they
thereabouts, the sexes become a scarlet fly, with two transverse lines on his body." "He is now (after sunrise), but rarely takes to the wind; he jumps and flutters about, and, having impregnated the female,

Female.
1472

in roundness. They appear generally eyes and mouth are quite sunk in and legs are almost covered by them, and are so motionless from the swellings about the articulations of their legs, that they can scarce move them, much less move themselves, and the insect to the casual observer looks more like a berry than an animal. When they are about three months old they begin to yield their young. In this state the female may be detached from the plant. She trembles an amber-coloured liquid globule, and

Cochineal
nesting.
1473

moment of her fixing upon the plant, she loses her eyes and the form of her head, instead of a mouth she has an extremely fine proboscis, which it is supposed she introduces into the imperceptible pores of the leaf she feeds on; and such is her excessive torpor, that once removed she will not attach herself again. After shedding the whole of her young, the mother dies and becomes a mere shell, turning black. It is therefore at the time that the female commences to shed her young that measures are taken to remove the young to other cactus leaves. A nest is formed, in the shape of a sausage or purse, of small holes, in which 8 or 10 of young escape and spread themselves mid day is found to be the best time to remove the newly-born insects to get rid of the glut. On this account nesting "The common belief is that he case. The young insects, to be all connected one after placenta, and in this order they are in due time brought forth as living animals, after breaking the membrane in which they were at first probably contained as eggs. Being thus brought forth, they remain in a cluster under the mother's belly for two or three days, until disengaged from the umbilical cord. Every cochineal mother produces above a hundred young ones; but the mortality is great, and three or four mothers are required to cover one side of a cactus leaf with sufficient young for cultivation."

1474

PROPAGATION.

In an interesting pamphlet written by I. S. C. D. and published by the Government, much useful information has been brought together regarding the various systems pursued in America and other countries in the propagation both of the insect and the plant. We cannot afford space to deal with this subject, and must accept the above abstract of the

C. 1474

The Cochineal Dye.

COCCUS
cacti.

life-history of the insect as indicating the great governing factors with regard to the insect, and refer the reader to *Opuntia Dillenii* in another volume for the more important facts regarding the plant. The following abstract from the above pamphlet may, however, be found useful: "The proper manner of gathering varies according to the object to which the plants are devoted, but, as a general rule, the leaves on which the bags are placed are sharply cut off with a knife, close to the branches, and the cochineal is swept off them into broad baskets closely woven to prevent loss."

"After the leaves are all cut off and swept, they are dropped into the ridges, where they are left, another set of gatherers carefully scrape off the insects which have passed into the branches or trunk of the plant, since leaving only one or two of these insects on the branches is fatal to the health of the plant." "The cactus cannot bear much water when not strengthened with manure." "When a plantation is reserved for the production of a winter crop, the leaves should be covered with cochineal in the month of October or November, by planting the young cochineal at this season it ripens, and is ready for gathering at the latter end of February or of March. Another part of the plantation is reserved for receiving the seed at this season; but as the plants cannot be forced to bud during the winter, the seed must be planted in March upon last year's leaves, which have the disadvantage of being tough for the insect, and this renders a winter crop more precarious than one obtained in summer." Wind and rain are very destructive: hence a region with a pronounced rainy season would either be unsuitable or the seed-stock at least

Collection.
1475Propagation.
1476Suitable
Climate
1477Treatment of
Crop
1478
DYE
1479

COCHINEAL DYE.

Mr. Wardle, in his recent *Report on the Dyes of India*, mentions experiments performed by him with several samples. Of a Hyderabad sample he says, it "appears to be very good." "The Government report, in which reference is made to it, is by Major W. Tweedie." "It would be interesting to ascertain whether the cochineal is produced in the Hyderabad Residency, or is imported from South America." Of

sists of insects matted together by some dark-coloured substance. Both samples small and poor." Reference has already been made to Dr. Dempster's report on cochineal from the lower North-Western Himalayas. He says: "It is beyond all doubt a true *Coccus cacti*; and although it will probably turn out to be a distinct and separate species, it agrees very closely with the description given of the woodland or wild cochineal of Mexico." It may be observed that the word "true," used in the first clause of the sentence, somewhat contradicts the concluding words, and further, that the "wild cochineal" is not the Mexican insect. Dr. Dempster continues: "In the month of December the young brood were extremely numerous, very lively, and ready to leave the mother and spread themselves over the plant. Sulphate of alumina, added to an alkaline solution of the colouring matter of the native (*sic*) cochineal,

C. 1479

Cochineal as a Medicine.

COCCUS
cacti.Wool dyeing.
1483

crimson, and a yellowish or fiery red, called scarlet." Wool mordanted with 2 per cent. of bichromate of potash and dyed in a separate bath receives a good purple, the colour being darkened by the addition of sulphuric acid to the mordant. Mr. Hummel gives particulars of the dyeing for crimson or scarlet. Wool to be dyed the former colour is mordanted with aluminum sulphate and tartar, the dyeing being effected in a separate bath. There are other methods, but the above is perhaps the best. Lime-salts are not beneficial. The latter shade is produced by the acid of stannous salt and cream of tartar or oxalic acid. The mordanting may be performed separately or along with the cochineal.

Silk dyeing
1484

For silk the mordant is alum, to be worked into the fabric for half an hour and steeped overnight. The fabric is then washed and dried and dyed in a separate bath. This gives the crimson. For the scarlet, after boiling and washing, the silk is first grounded with a light yellow produced with soap and annatto and thereafter washed. For darker shades soap should not be used. In both cases the fabric should be mordanted by the same process as described for the crimson, only using nitro-muriate of tin in place of alum. By the aid of iron mordants fine shades of lilac may be obtained.

Pigments.
1485

In a recent report on the pigments used in the North-West Provinces the following particulars are given regarding cochineal. One part of cream of tartar to $\frac{1}{10}$ of alum and four parts of cochineal are used.

COCHINEAL AS A MEDICINE.

MEDICINE.
1486

Medicine.—Cochineal is used mainly as an agent for colouring drugs, but it is supposed by some to possess anti-spasmodic and anodyne properties.

CHEMISTRY.
1487

Chemical Composition—As far as has been determined, cochineal and lac owe their tinctorial properties to an acid apparently identical in charac-

carminic acid, a nitrogenous compound which they expressed by the formula $C_{14}H_{12}NO_8$. Subsequent observers (Arppe, Warren de la Rue, Hugo Muller, &c.) showed it to be an acid, and found that, in a perfectly pure state, it does not contain nitrogen, though accompanied by nitrogenous matter which it is difficult to separate from it. John named the colouring principle cochineal. The acid of the authors named has been expressed as $C_{14}H_{14}O_8$, but the crystalline carminic acid isolated by Dr. Schützenberger by Dr. Schaller $H_{15}O_{10}$ (Crookes) aqueous extract precipitate with sulphuric acid, and the precipitate decomposed, a second and a third time in a similar manner, employing, however, hydric sulphide to effect the final decomposition. The filtered solution is evaporated to dryness, the residue dissolved in alcohol, and the crystalline nodules of carminic acid

[illegible]

The chemical history of the examined is, however, incomplete. The alkali esters are soluble in ether, as far as has been ascertained, are amorphous substances. The different results obtained with each nail up to the influence of chemical reagents is due to the presence of nitrogen, but, as indicated, as a general rule, acids turn the colour to yellowish red, oxalic acid producing the best result, while the alkali esters turn it to violet.

1483

lines with the elements of ammonia, thereby forming an amide acid.

1489

TRADE IN COCHINPAL.

The Madras Government exported, in September 1797, 21,744^{lb}. From the reports of the sales of Indian Cochineal during the years 1798, 1799, 1800, 1801, 1802, 1803, 1804, 1805, 1806, 1807, 1808, 1809, 1810, 1811, 1812, 1813, 1814, 1815, 1816, 1817, 1818, 1819, 1820, 1821, 1822, 1823, 1824, 1825, 1826, 1827, 1828, 1829, 1830, 1831, 1832, 1833, 1834, 1835, 1836, 1837, 1838, 1839, 1840, 1841, 1842, 1843, 1844, 1845, 1846, 1847, 1848, 1849, 1850, 1851, 1852, 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1860, 1861, 1862, 1863, 1864, 1865, 1866, 1867, 1868, 1869, 1870, 1871, 1872, 1873, 1874, 1875, 1876, 1877, 1878, 1879, 1880, 1881, 1882, 1883, 1884, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1894, 1895, 1896, 1897, 1898, 1899, 1900, 1901, 1902, 1903, 1904, 1905, 1906, 1907, 1908, 1909, 1910, 1911, 1912, 1913, 1914, 1915, 1916, 1917, 1918, 1919, 1920, 1921, 1922, 1923, 1924, 1925, 1926, 1927, 1928, 1929, 1930, 1931, 1932, 1933, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 24

C. 1489

The Lac Insect.

COCCUS
lacca.

1490

writer was informed by a merchant that so completely had the lac-dye trade been destroyed by aniline that a large quantity of lac-dye was recently thrown into the Thames as worthless and unsaleable. (For the trade in lac-dye see a further page)

Coccus lacca, Kerr.

1491

THE LAC INSECT, *Eng.*; LAQUE, *Fr.*; LACK, *Germ.*; LACCA, *It.*

Vern.—*Lakh*, *HIND*, *Gald*, *BENG*, *Lakshd*, *SANS*.

It is found in India, and occurs especially in Butea, or a complete list of

the plants on which it feeds, see below.

1492

DESCRIPTION AND MODE OF GROWTH—Lac is the resinous incrustation formed on the bark of the twigs, through the action of the lac insect. When the larvæ or grubs of the *Coccus lacca* escape from their eggs they crawl about in search of fresh sappy twigs. When satisfied, they become fixed and form a sort of cocoon by excreting a resinous substance. The male cocoon is ovoid in shape, the female circular. For about 2½ months the insects remain within their cocoons in the lethargic state, but structural changes have been accomplished by which they have reached the mature or imago condition. The male escapes from the cocoon by bricking out at the ventral opening. The female has also become mature, but since it is destined to remain in its present position, it renews actively more perfect coating of resin.

It is supposed that there are Upon the circular body of the

female there are three openings, which become developed, as the incrustation proceeds, into three filamentous tubes. One serves the purpose of an anal opening, and through it impregnation is also accomplished, the others are breathing stomata. When the male escapes from the cocoon, it at once commences to crawl over the females. The impregnated female, after depositing her eggs below her body, commences to construct cells round each with as much precision as the bee forms its comb.

The irritation caused by parasitic insects on vegetable tissues results in the formation of many curious and extraordinary structures, some of which are economically of great use to man, such as gall-nuts, lac, &c. In the case of the lac insect, the plants chosen are those naturally possessed of resinous principles, but still the insect exercises a peculiar influence over the resinous sap, changing its properties entirely. The *Coccus lacca* penetrates the bark of the twig by its proboscis or penetrator until it reaches the

siderably and becomes brilliantly coloured. The red colour is due to the formation of a substance intended as food for the offspring. The eggs germinate below, and the larvæ, eating their way through the body of the mother, make their escape to repeat this strange history.

C. 1492

COCCUS
lacca.

Trees on which the Lac Insect feeds.

1493

TREES ON WHICH THE LAC INSECT IS REPORTED TO FEED

- 1 *Acacia arabica*, Willd (LEGUMINOSÆ) The *Babul* or *Kikar* (Gamble, 151) "In Sind and Guzerat yields large quantities of lac."
- 2 *Acacia Catechu*, Willd (LEGUMINOSÆ)
- 3 *Albizia lucida*, Benth (LEGUMINOSÆ). *Silkari*, BENG
- 4 *Alecrutes moluccana*, Willd (EUPHORBIACEÆ) The *Akrol* of the plains, introduced from Malty, now almost wild, especially in South India
- 5 *Anona squamosa*, Linn. (ANONACEÆ) The *Ata*, a tree introduced from the West Indies
- 6 *Butea frondosa*, Roxb (LEGUMINOSÆ) The *Dhak* or *Palas*
- 7 *Butea superba*, Roxb (LEGUMINOSÆ). A climber, scarcely distinguishable from the tree *B frondosa*, except by its habit.
- 8 *Carissa Carandas*, Linn (APOCYNACEÆ) Var. *spinatum*, sp, A DC
- 9 *Celtis Roxburghii*, Bedd. (URTICACEÆ) Eastern Bengal, Central and South India
- 10 *Ceratonia Siliqua*, Linn (LEGUMINOSÆ) The *Carob Tree*; now almost naturalised in the Panjáb and South India.
- 11 *Croton Draco*, Schlecht (EUPHORBIACEÆ)
- 12 *Dalbergia latifolia*, Roxb (LEGUMINOSÆ)
- 13 *Dalbergia paniculata*, Roxb (LEGUMINOSÆ)
- 14 *Dichrostachya cinerea*, W & A (LEGUMINOSÆ) The *Virtuli*, a shrub of Central and South India
- 15 *Dolichandrose Rheedii*, Seem (BIGNONIACEÆ) A small tree of Burma and the Andaman Islands
- 16 *Eriolana Hookeriana*, W & A (STERCULIACEÆ)
- 17 *Erythrina indica*, Linn (LEGUMINOSÆ)
- 18 *Feronia Elephantum*, Correa (RUTACEÆ)
- 19 *Ficus bengalensis*, Linn (URTICACEÆ)
- 20 *Ficus comosa*, Roxb, in Assam
- 21 *Ficus cordifolia*, Roxb (Gamble 335) Assam Lac
- 22 *Ficus elastica*, Bl The India rubber Tree (the *Bar*)
- 23 *Ficus glomerata*, Roxb
- 24 *Ficus infectoria*, Willd The *Pakar* or *Keol*.
- 25 *Ficus laccifera*, Roxb (URTICACEÆ) A native of Sylhet, the *Ruthal But*
- 26 *Ficus religiosa*, Linn The *Aswat* or *Pipal*
- 27 *Garuga pinnata*, Roxb (BURSERACEÆ) The *Garuga* or *Kaikar*
- 28 *Kydia calycina*, Roxb (MALVACEÆ) A small tree the *Pola*
- 29 *Lagerstromia parviflora*, Hook f. (LYTHRACEÆ) The *Bakli* or *Si ?*
- 30 *Mangifera indica*, Linn (ANACARDIACEÆ) The *Mango*, in its wild state, often yields lac.
- 31 *Nephelium Litchii*, Camb (SAPINDACEÆ) The *Lichi*
- 32 *Ougeinia dalbergioides*, Benth (LEGUMINOSÆ) The *Sandan*
- 33 *Prosopis spicigera*, Linn (LEGUMINOSÆ). The *Jhand* of the arid zones of the Panjáb and Guzerat
- 34 *Pterocarpus Marsupium* Roxb (LEGUMINOSÆ) The *Biya* or *Kino* tree, a native of Central and South India
- 35 *Pathecolobium dulce*, Benth (LEGUMINOSÆ) The *Dakhini babul*, a tree introduced from Mexico
- 36 *Schima crenata*, Korth (TERRASTREMIACEÆ) An evergreen tree of Burma

C. 1493

Uses of Lac.	COCCUS lacca.
37. <i>Colletia tomentosa</i> , Willd. (RHAMNACEÆ). The <i>Kum</i> or <i>Kusumb</i> . The bark of the tree yields a lac which is used for various purposes.	
38. <i>Colletia tomentosa</i> , Willd. (RHAMNACEÆ). The <i>Kum</i> or <i>Kusumb</i> . The bark of the tree yields a lac which is used for various purposes.	
39. <i>Colletia tomentosa</i> , Willd. (RHAMNACEÆ). The <i>Kum</i> or <i>Kusumb</i> . The bark of the tree yields a lac which is used for various purposes.	
40. <i>Tectona grandis</i> , Linn. (VERBENACEÆ). The <i>Teak-wood</i> , a native of India.	
41. <i>Tectona grandis</i> , Linn. (VERBENACEÆ). The <i>Teak-wood</i> , a native of India.	
42. <i>Tectona grandis</i> , Linn. (VERBENACEÆ). The <i>Teak-wood</i> , a native of India.	
43. <i>Zizyphus zeyheri</i> , Willd. (RHAMNACEÆ). The <i>Kut-ber</i> .	
PROPERTIES AND USES OF LAC.	
After the lac is removed and cut up into small pieces, they are spread upon a flannel cloth, which the resinous crust is fully removed, and the resin thrown into tubs of water, where it is either beaten with a wooden pestle or trodden under foot. The liquid becomes red coloured, and one	Stick lac. 1494 Lac-dye. 1495
The lac is now seed-lac of con- fect long and	Seed-lac. 1496
The lac is forced, These are of the thin- est known in the world.	Shell-lac. 1497
The lac is forced, These are of the thin- est known in the world.	Sheet-lac. 1498
The lac is forced, These are of the thin- est known in the world.	Button-lac. 1499
The lac is forced, These are of the thin- est known in the world.	D.C. 1500
The lac is forced, These are of the thin- est known in the world.	Liver. 1501
The lac is forced, These are of the thin- est known in the world.	Native Orange. 1502
The lac is forced, These are of the thin- est known in the world.	Garnet. 1503
The lac is forced, These are of the thin- est known in the world.	Native-leaf. 1504
The lac is forced, These are of the thin- est known in the world.	Adulterated Lac 1505

COCHLOSPERMUM
Gossypium.
Lac Dyer White Silk-Cotton Tree.

small on crushing the lac. The writer was once informed by a merchant that his firm in the moral course of business imported very largely resin which he believed was used up by the native dealers in adulterating the lac which they and other merchants exported. The gentleman in question condemned strongly the process of adulteration, but justly remarked that resin was an ordinary article of trade used for other purposes which if they discontinued to import would only be more largely imported by other firms.

Varnish.
1506
Paint.
1507
Sealing-wax.
1508
Cement.
1509
LAC DYE.
Dye.
1510

textile purposes but as a pigment. It is by them largely used for colouring leather and in wool and silk dyeing, although aniline has affected the

in Bengal, and Sir E. O. Bu information regarding its use the existence of the resinous lac is not so easily worked as we have already discussed slight modifications to the properties of both dyes,

1511
broil

speaking, it will not now pay to boil down the coloured washings obtained as a by-product in the shellac industry. Although still used to some extent in India, the article is scarcely, if at all, exported.

COCHLOSPERMUM, Kunth.; Gen. Pl., I., 124, 971.
1512
Cochlospermum Gossypium, DC.; Fl. Br. Ind., I., 189; BIXINEZ.
SOMETIMES CALLED WHITE SILK-COTTON TREE.]
C. 1512

White Silk-Cotton Tree.

COCHLOSPERMUM
Gossypium.

Syn.—*OMBAX GOSSYPIUM*, Linn ; Roxb, *Fl Ind*, ed, C. B C, 515.

Vern.—*Kumbi*, *gabli*, *gamár*, *galgal*, *gangal*, HIND ; *Hopa*, SANTALI ; *Gulgal*, HOLL ; *Gangam*, GOND ; *Kontopalás*, URIYA, *Kumbi*, Pn ;

For the Gum.—Moodeen Sheriff gives the following *Nat ká katérd*, *ndi ká-katérd gónd*, DEC., *Hindu-katérd*, HIND. ; *Tanaku pishin*, TAM. ; *Konda gógu-banka*, *konda gogu-pisunu*, TEL ; *Shima-pangi pasha*, MAL.

For the Cotton.—*Pili kápis kú-rú*, *katérd ká jhár-kí rú*, DEC ; *Tanaku parutti*, TAM, *Konda gógu-patti*, TEL, *Shima pangi parutti*, MAL.

References.—Brandis, *For Fl* 17, *Gamble*, *Man Timb*, 17, *Dymock*,

Part I, 18, also *Him. Dist*, 733, 783, *Cooke*, *Gums and Gum-resins*, &c, 29, *Drury*, U P, 141 ; *Murray*, *Pl and Drugs*, Sind, 47, *Forest Ad. Rep*, *Chutid Nágpur*, 1885, p 28.

gro
Sut
Deccan, also in the Prome district of Burma. Commonly planted near temples. When the tree is devoid of leaves (in March to April) it bursts into its handsome large yellow flowers, its pendulous, pear-shaped fruits ripening before the new leaves appear.

Gum—This is often sold in the bazaars of India as *katíra* or *kathíra* (the Persian and Arabic for *Tragacanth*), that name having been given to the gum of this tree by the early Muhammadan settlers in India.

GUM
1513

doubtless be employed to impart a polish to tasar silk.

Stewart remarks "The *katíra*, of which 10 maunds are stated by Davies' *Trade Report* to be imported annually *via* Peshawar, must be entered by mistake, or be the product of a different plant" (Doubtless the true *katíra* or *Tragacanth*—Ed) "And, oddly enough, the same authority gives 50 maunds of this substance as exported from Ludhiana

C. 1513

OIL.
1516

Flax being viewed as possessing the merit of elasticity—a merit which might allow of its competing favourably with the true kapok.

Oil.—The Rev. A. Campbell, Santal Mission, Chutal Nigpur, describes a bright red oil which by hot expression he extracted in abundance from the seeds. He adds, although this property of the seeds is well known to the Santals, they never extract the oil. Cooke in his *Oil and Oil-seeds* alludes to this circumstance, but remarks that beyond the fact of the seeds affording an oil, nothing further is known. Samples of the oil were shown at the late Colonial and Indian Exhibition and these are now deposited in the Kew Museum. Were a use to be found for the oil it

MEDICINE.
Gum.
1517
Floss.
1518

Medicine.—The gum has the properties in a mild degree of Tragacanth, for which it is proposed by Moodeen Sheriff and others as a substitute. It is also used as a mild demulcent in coughs. The floss has been recommended as admirably suited for padding bandages, splints, &c., being soft and cool. On this account it has been suggested as suitable for pillows and cushions used in hospitals, &c. Irvine (*Mat. Med.*, Patna, p. 78) says the dried leaves and flowers are used as stimulants.

TIMBER.
1519

Structure of the Wood.—Extremely soft, grey, but has no heart-wood, and is not apparently put to any useful purpose; weight 17½ per cubic foot.

Cockles, see Molluscs (edible).

Coco or Cocoa, see *Cocos nucifera*; Coca, see *Erythroxylon* and Cocoa Nibs, see *Theobroma*.

C. 1519

The Cocoa nut Palm.

COCOS
nucifera.

COCOS, Linn ; Gen. Pl., III, 945.

Cocos nucifera, Linn ; Brandis, For. Fl., 556; PALME.

1520

THE COCOA-NUT PALM; THE COIR OF COCOA-NUT FIBRE;
PORCUPINE WOOD; COCOSER, Fr.; COCOSNUSS, KAIR,
Germ.

VERN.—Nareli, nariyal, nariel, nariyel, nariyal ka-pér, HIND ; Nārikel, nariyal, dāb, narakel, BENG ; Nariel, nariyella, nāriera, nāliyer, nāryal, jhāda, nāryal, GUJ ; Maar, nari, mahad, nareli, narak-cha jhāda, mā, naural, BOMB ; Narela, nārula, nāralmāh, mā, māda mahad, varala, nareli, narak-cha jhāda, narak, mar, tenginmar (the juice yield form in Kanara), MAR ; Nārel kē jhār, nārel DUK ; Tenna, tēnga, tennan-chedi, tenna maram, tēngay, tēngay, TAM ; Nari kadam, ten kosa, kobbari, goduri lora, ten kaya, kober chullu, kōbāri chettu, tēkaya chettu, erra-bondala, puyy-narekadam, TEL ; Thēppanna, kī-

badini (naryale in Ainslie), PERS ; Pol, pol gass, pol gād, pol natāsi, tambili, SING ; Ong, ung, ung-bin, ōn, onsi, onti, ondi, BURM ; Kalapa, JAV.

DRY KERNEL, COPRA (KOPRA) or COPPERAH—

Alāpā, HIND ; Alāppu, GUJ ; Alāpā, Alāpā kē-batti, DLK ; Kōkharāli tēngay, TAM ; Kōbbera, kōbbera tēnkāya, TEL ; Alāpara, MALA ; Kōbāri, kōbbāri, KAN.

OIL, COCOA NUT OIL—

Alāpā kē tēl, nariyal-kē-tēl, nareli-kē-tēl, HIND ; DLK ; Nārikēl-tail, nariyal tēl, BENG ; Nariyal-nu-tēl, GUJ ; Nārikēl-tail a, narak-tēl, kōbāri kē tēl, MAR ; Tēngay-nare, tēngay nūy, tēngay-nare, TAM ; Tēnkāya-nare, tēnkāya nūy, TEL ; Tēnnan-nā, minak, kalapa, minak-nū, nū-minak, kalambir, kalapa minak, MALA ; Tēngay-nare, kōbri, KAN ; Nārikēl tailam, SANK ; Dhonnun-nariyal, dhonnun-nariyal (Javanese in Ainslie), ARAB ; Kigkone nareli, kigkone-bāndin, PERS ; Sol tel, SING ; On si, BURM ; Coy-dua, COCHIN-CHINESE.

WATER—

Tēnnir-kāpani, DLK ; Tēllā nir, TAM ; Tēllā niru, TEL.

TODDY—

Nareli, HIND ; Nareli kē stūda, nareli, DLK ; Tēngā kallu, tēnnan-kallu, tēnnan-kallu, TAM ; Tēnnāra kallu, tēnkāla, TEL ; Nareli, nareli, ARAB ; Tēngay-nareli, PERS.

FIBRE—

Coir ! (See first paragraph of this list on Coir), HIND ; Tēnnam nare, TAM ; Tēnkāla nare, TEL.

COCOA-NUT CABBAGE—

Tēnnam kuru, TAM ; Tēnkāla kuru, TEL ; Kōbāli kuru, ARAB.

COTON OF TOBACCO—

Tēnnam marūti pūngur, TAM ; Tēnkāla marūti pūngur, TEL ; Tēnnam-pūngur, MAL.

References.—Rost, F. Ind., II, C. F. C., 174, 175, 176, For. F. Farm., II, 40 ; Camé. & Pan. Tim., 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

C. 1520

COCOS
nucifera.

The Cocoa nut Palm.

Paper making, 4, 14 16, 22. *Treatise on the Prince of Lanna's* Conde, Gums & Gum resins, 12, Co. 12, Oils and Oil seeds, 11; Co. 12, Dyeing, 120, Medica 8, Bomb 12, 191, 212 219 220 310, 338; Lihua, 11 11 125, 126, 127 257; *Spon's Encycl* p. 9 32, 131, 133, 134, 135; *Half hr. Cyclop.*, Smith Dic., 123; *Treasury of Botany*, 12, *Dic Int Artisan Minu*, 541, *New Official Guide to the Museum of Economic Botany*, 21 *Met Trop Asiere*, 141; *Shortt, Monograph on the Cocoa nut*, 1885. *Jackson, Treatment of Cocoa nut in the Planters' Gazette*; *Trop Agri*, 1882 93 pp 324 54, 542, 601, 633, *Simmonds, Trop Agri*, 220-221; *Mysore, Cal Cal Feb*, 12, *Town Agri Hort Soc Int*, 1843, p 243, *Sam's Gazetteers*, Vols VIII, 95, X, 34-35; XI, 27 30, VIII, 1, 225; XV, 1, 35-40, XVIII, 20, XVII, 303; N H P Gaz, VI, 147, 220, 203, 73, 779; *Mysore Gaz*, I, 131 131, II, 202; *Burma Gaz*, I, 131; *Imperial Geo*, Vols I, 282, VII 372, 380; VIII, 324; IX, 270, X, 264; *Administration Reports of the Andaman and Nicobar Islands*, Morru, Calcutta District, *Matras*, p 70; *Selections, Records, Matras Gov*, XVIII, 13 131. *Cleghorn, Flind New Phil Journal*, 1851, Marshall, *Natural and Economic History of the Cocoa nut*, 1832, Robinson, *Report of the Laccadive Islands*, Bennett's *Wanderings*, II, 205. Rumphius in his *Herb Ambon*, I, pp 1 13, gives a long account of the use of the cocoa nut, under the name *Palma indica major*; Koch, *Corom*, I 52, t LXVIII; *Aristen Relat*, III, 2; also *Hist Herbaria*, pp. 258, 259, *Laureiro, Flora Cochinchinensis*, II, 576.

Habitat—A pinnate-leaved palm, with a straight or often gracefully curved stem, marked by annular scars, cultivated throughout tropical India and Burma especially near the sea-coast. On the eastern and western coasts it is particularly abundant, more so towards the south. There are several cultivated varieties but all flower in the hot season, the nuts ripening from September to November. Dr Shortt states that in South India the palm thrives at altitudes up to 3,000 feet above the sea, and he even mentions one on the Shevroy Hills at 4,500 feet. Cocoa nuts are abundant in Bangalore up to 3,000 feet.

Starting from the Bay of Bengal, the cocoa-nut palm follows the Gangetic basin inland for about 150 to 200 miles, from the western coast its cultivated distribution inland is much more limited, and in Kolabar, for example, is little more than half a mile from the beach. In very exceptional circumstances, or under the most careful garden cultivation, it may be seen further inland in Bengal than stated, and it even occurs in some parts of Assam. It is, however, essentially a plant of the coast, and luxuriates on the islands of the Indian Ocean. The Indian region of the cocoa nut may thus be said to be the lower basins of the Ganges and the Brahmaputra, and the Malabar and Coromandel coasts. In the Brahmaputra valley it ascends to a greater distance from the sea than in the Gangetic, but in both it is an introduced tree, as it nowhere occurs in forests far away from human dwellings. On the Malabar coast, and on the islands off the coast of India, it may be different, but even in these localities it rarely exists as a forest tree, although it is self sown. It is abundant on the Laccadive Islands, and on the Nicobar group in the Bay of Bengal, but excepting the recent efforts at cultivation, it was formerly rarely met with on the Andaman Islands, which are only 72 miles to the north. It re-appears again, however, abundantly on the Cocos Islands, a small group lying some 30 to 40 miles still further north (where it is in no way cultivated). M. DeCandolle states briefly the arguments in favour of an American as well as those of an Asiatic origin for this tree, and concludes by expressing the opinion that it most probably belongs to the "Indian Archipelago." Its introduction into Ceylon, India, and China, he states, does not date further back than three thousand years, "but the transport by sea to the coasts of America and Africa took place perhaps in a more remote epoch, although posterior to those epochs when the

The Cocoa-nut Palm.

COCOS
nucifera.

geographical and physical conditions were different from those of our day."

CULTIVATION OF THE COCOA-NUT.

It is commonly reported that there are in India 480,000 acres under the cocoa-nut. A number of passages from Indian authors will be found scattered through the present account of the palm, which every now and again recur to the question of its cultivation. It may, however, be desirable to give here a brief abstract of the opinions published by the better known European writers, since from these may be gathered the results of scientific experiments.

SOWING.—Ripe nuts, carefully collected, should alone be employed as seed, and for this purpose they are usually gathered from February to May. Seed from very young or very old trees should be avoided. After having been kept for a month to six weeks they should be planted. This may take place in January to April, or again in August, provided the rains are not heavy. The seed-beds should be dug 2 feet deep and the nuts planted 1 foot apart. The nuts should be laid on their sides, leaving 2 inches of their surface exposed. Ashes, or ashes and salt, should be freely placed in the trenches; these act both as a manure and as a preventative against insects. The seed-bed thus prepared should be kept moist, but not soaked. The germinated seeds may be transplanted when they are in their second to their sixth or even twelfth month. In the Godavari district they are placed in their permanent positions when three to four years old. In damp localities the transplanting may be done in the hot season, otherwise during the rains.

TRANSPLANTING—The seedlings should now be put out in the plantation pits. In rich soils the pits should be 2 or 3 feet deep. In marshy land, the seedlings are recommended to

be freely mixed with the prepared soil to be put into the pits, as this is supposed to prevent the attacks of the beetles that prove so destructive to the trees. Cultivation of turmeric, arrowroot, &c. in the pits, along with the cocoa-nuts is believed to be beneficial. The soil round the seedlings is also often kept damp by a bed of leaves, particularly such as will not en-

CULTIVA-
TIONSowing.
1522Transplant-
ing.
1523Treatment
of Plantation.
1524

should be opened out and manured about the commencement of the rains. The soil should be kept moist and the seedlings should be By
5; it
The
then
1 to 2 feet above the ground, but in exceptionally favourable climates and soils it may be three or four feet above the ground. They do not form fruit four more years in rich soils and if water is given to poor soils and if the soil is not till the trees are set, and by the end of the year they are fully ripe.

Cocoa-nut palms may be easily transplanted, and indeed often with advantage. Some of the fibrous roots should be cut away, and manure,

COCOS
nucifera.

The Cocoa-nut Palm

CULTIVA-
TIONYield
1525

together with a little salt, placed in the pit in which it is intended to plant the tree.

YIELD—An rule a cocoa-nut throws out 1 spathe and a leaf every month; each flowering spike yields from 10 to 25 nuts. The produce of a tree in full health and properly tended may be from 50 to 120 and even 200 nuts a year, the yield depending greatly, of course, on the suitability of the climate and soil for cocoa-nut cultivation, a safe average would be 100 nuts a year to each tree in full bearing. The cocoa nut will continue to bear for 70 to 80 years.

1526

CULTIVATED FORMS

There are five recognisable varieties of the cocoa-nut met with in Ceylon. These have been described as, *1st*, the *Tembili*, a plant with an oval-shaped nut of a bright orange colour, *2nd*, a more spherical form, *3rd*, a heart-shaped fruit of a pale yellow colour, with an edible inner rind, which turns red when the outer skin is removed, *4th*, the ordinary form, *5th* a small nut about the size of a turkey's egg. This last form is rare but much admired. Spon (*Encycl.*, 1353) says "there are some 30 varieties of cocoa-nut distinguished by the natives of the districts producing them, but many of these distinctions are obviously groundless." Repeated reference will be found throughout this article to the different forms which occur in India, but of these, with perhaps the exception of that met with in the Laccadives, scarcely any deserve special mention. The Laccadive small-fruited form, with a soft, fine, but strong coir, seems well worthy of special consideration where the object of cultivation is the production of fibre. Dr Shortt says there are 30 different forms in Travancore. He adds: "The largest variety of cocoa-nut that I have seen and examined comes from Ceylon. I have occasionally seen specimens nearly as large from the Coromandel coast. There is a small dwarf variety which fruits while it is about 2 feet high, the plant continues to grow and with age attains to a height of from 10 to 15 feet." A small form is met with in East Africa that does not possess the fibrous pericarp—(see concluding sentence of chapter on medicinal properties, page 448). In Indian newspapers announcements of branched cocoa-nuts occasionally appear, as also of branched date-palms. These are viewed with superstitious horror by the ignorant. They are most probably the result of two plants growing together, or of two or more embryos in one nut.

Dwarf
Cocoanut.
1527Soil
1528

SOIL—The cocoa-nut "thrives best in low, sandy situations, within the influence of the sea breeze, and never attains the same perfection when grown inland" (*Spon's Encycl*). Simmonds writes "Soils suitable for a cocoa-nut plantation are variously described as below, particularly observing that stony grounds, or those overlying rocky foundations, are to be avoided—

- "1. Soils mixed with sand, either dark-coloured or river-washed.
- "2 Where sand is mixed with clay, ferruginous earth, or black mould.
- "3 Clayey soils where the under-strata consist of sand
- "4 Sand and clay, even when mixed with gravel and pebbles
- "5 The sea-shore banks of backwaters, rivers, tanks, and paddy-fields.
- "6 Alluvium of rivers and backwaters, provided a yard and a half of land is to be generally seen above water level
- "7. Marshy land even in brackish soils (but not where salt is formed in crystals by evaporation)
- "8 All level lands exposed to the sea breeze where the soil is good, as the valleys between hills, tanks, and ditches which have been filled up
- "9 Lastly, even the floors of ruined houses well worked up, and any places much frequented by cattle and human beings on account

The Cocoa nut Palm

COCOS
nucifera.CULTIVA-
TION

of the ashes and salts of ammonia from the urine, &c., deposited dry by dry in the soil."

Simmonds further says "The nuts for seed should not, on being gathered, be allowed to fall to the earth, but be lowered in a basket or fastened to a rope. If let fall, the polished cover to the fibres will be injured and collect damp about the nut, or the shell inside may be cracked and the water disturbed. These are fatal injuries, or even if the plants still grow, they will, on being transplanted, not make fresh shoots, but produce weak trees having their fronds constantly drying up, nuts rarely matured, and often are even without kernel in those which appear perfect. If the nuts are allowed to dry on the tree before gathering, the plants are liable to be lost, not having water inside to cherish the growth of the sprout (before the actual roots shoot into the soil)."

"Nurseries should be somewhat exposed to the influence of the sun, though not too much heat. Plants thus grown will even, though deficient in stature, be strong, and when transplanted will not fail, nor suffer from heat. The planting of the nuts should take place in January to April, and also in August provided the rains are not heavy, and then the planter may expect fruitful trees to be produced when grown, but nurseries formed during the heavy monsoon will generally fail, or produce trees which will yield small nuts. Too much moisture of every kind is injurious to the plants." Speaking of soils Dr Shortt says "The cocoa nut requires alluvial and loamy soil for its successful growth, but any soil with a free mixture of sand and clay answers fairly well. Sea-sand where procurable is recommended to be thrown into the pits when the earth is being returned around the plants. Half sand half earth is considered the best material to fill up the pits with."

PECCILIARITIES OF INDIA CULTIVATION

The following passages from the Gazetteers will be found instructive and of value to intending cultivators as having a special bearing on India.

1 In Bombay (Kolab District) — Of the liquor yielding trees of this district the cocoa palm is the most important. The moist climate, sandy soil, brackish water, and abundance of fish manure, make its growth so vigorous that the yield of juice is much in excess of the wants of the district. The trees are grown within walled in or hedged enclosures, sometimes entirely given to cocoa nut palms, in other cases partly planted with mangoes jack betel nut and other fruit trees. Every garden has one or two wells, from which the trees are watered by a Persian wheel. In starting a cocoa nut garden, a bed is prepared, and in it, at the beginning of the rainy season, from twenty to forty large, ripe, unhusked nuts are planted 2 feet deep. The bed is kept soaked with water, and after from three to six months the nut begins to sprout. The seedlings are left undisturbed for two years. They are then, at the beginning of the rains, planted in sandy soil in rows about 18 feet apart, and with a distance of about 15 feet between the plants. For about a foot and a half round each plant the ground is hollowed 3 or 4 inches deep, and during the dry months the plants are watered daily or once in two days, and, once or twice in the year, enriched with fish manure or with a mixture of salt and *nachni*. When nine years old the trees begin to yield nuts twice a year and sometimes thrice, 120 nuts being the yearly average yield from each tree. The trees are then ready to be tapped. Each cocoa-palm, when ready for tapping, is estimated to represent an average outlay of about 18s. (Rs)

* The cocoa-nut gardens are generally owned by high-caste Hindus who let the trees to some rich Bhandari who has agreed to supply the owner

1
Bombay
1529

COCOS
nucifera.

The Cocoa-nut Palm.

CULTIVA-
TION.

of the liquor-shops with fermented or distilled juice. The Bhandári pays
"th for every three trees"
hana District it is stated—

The best and oldest tree
in the garden is set apart for growing seed-nuts. The nuts take from
seven to twelve months to dry on the tree. When dry they are taken down,
generally in April or May, or left to drop. When taken down they are
either kept in a
nut dry, or, if
roof or tied to

thrown into a well and left there for three months, when they sprout.
If the nuts are left to drop from the tree, which is the usual practice in
Bassein, they are either kept in the house for some time and then left
to sprout in a well, or they are buried immediately after they have
fallen. When the nuts are ready for planting they are buried either en-
tirely or from one half to two thirds in sweet land, generally from 1 to 2
feet apart, and sometimes as close as 9 inches. A little grass, rice-straw,
or dry plantain leaves are spread over the nuts to shade them. If white-
or saltish mud
is over the nuts.

but the regular
season is from March to May (Chaitra and Vaisakh), when, unless the
ground is damp and their inner moisture is enough for their nourishment,
the nuts want watering every second or third day until rain falls. The
nuts begin to sprout from four to six months after they are planted, and
when the seedlings are a year or eighteen months old, they are about ten
years old, they are fit for planting.

from 5d. (3 annas 4 pie) for a one
6d. (4 annas) for a two-year-old plant. In planting them out the seedlings
are set about six yards (12 *hats*) apart in the 2-foot-deep holes, in which

are planted out the young trees are shaded by palm leaves or by growing
mulberry plantains. During the rains, from its fifth to its tenth year, a
ditch is dug round the palm and its roots cut, and little sandbanks
are raised round the tree to keep the rain-water from running off. In
the ditch round the tree, 22 pounds (4 *páylis*) of powdered dry fish

Tigham), and after five or six days with a layer of earth or a
mixture of cow-dung and wood-ashes covered with earth; or night-soil,
which on the whole is the best manure. Palms suffer from an insect
named *dhonga* which gnaws the roots of the tree, and from the large
black carpenter-bee which bores the spikes of its half-opened leaves.
When a palm is suffering from the attacks of the *dhonga*, a dark red
juice oozes from the trunk. When this is noticed, a hole 3 inches square
is cut in the trunk from 4 to 6 feet above where the juice is coming out,
and is filled with salt, which dries away or kills the insect. To get rid
of the boring bee, it is either drawn out by the hand, or it is killed by
pouring into the spike as much water or salt-water.

1530

The Cocoa-nut Palm.

COCOS
nucifera.CULTIVA-
TION.

"A well-watered and manured tree, in good soil, begins to yield when it is five years old, and in bad soil when it is eight or ten years old. A palm varies in height from 50 to 100 feet, and is in greatest vigour between the ages of twenty and forty. It continues to yield till it is eighty, and lives to be a hundred.

"When the tree begins to . . . at the bottom of which is a . . . After about a fortnight the tree . . . perfection. Many of the young nuts are unripe, and only a few reach maturity. A young nut is called *bonda*, a nut with a newly-formed kernel is called *shale*, and a fully-formed nut *narel*. A good tree yields three or four times a year, the average number of nuts being about seventy-five" (*Gaz.*, XIII., I., 295).

In the report of the Káthiawár District (*Bomb. Gaz.*, VIII., p. 95), there occurs a short but interesting account of the cocoa-nut: "At Ma-

with which it deals. "A singular fact about the cocoa-palm is that it grows freely in solid limestone, provided a hole about $\frac{3}{4}$ feet deep be

for the tree to grow. . . . that it grows

que . . . fromandel . . . plentiful . . . east. On . . . and more . . . may be

formed from the description of the town of Cannanore, the clumps of the cocoa-nuts being said "to be seen between the officers' houses, surrounding the cantonments in every direction, and extending in the distance as far as the eye can reach, the trees

a forest . . . that there . . .

coast and the Laccadive and Minicoy Islands are . . .

seats of the Indian . . .

nuts, coir, or cocoa- . . .

part of the country . . .

mentioned islands . . .

rently the islanders . . .

making coir or expressing the oil. So far this remark seems to be almost

of large islands under a Sultan, . . .

Ceylon, and not to the Viceroy . . .

since the casual examination . . .

of the trade returns might convey the idea that the Laccadives export no . . .

coir, if the still further error might not even be committed of supposing . . .

the Laccadives to contain no cocoa-nuts at all. The Laccadives are . . .

invariably under the administration of the Collector of Malabar, and the im- . . .

ports from these islands are treated as if they were produce of the main-

II
Madras.
1531

COCOS
nucifera.

The Cocoa-nut Palm.

CULTIVA-
TION

of the liquor-shops with fermented or distilled juice. The Bhandari pays the owner of the garden Rs 2 (2 shillings) a month for every three trees" (*Kolaba Dist., Bomb Gas., XI., 28*). Of the Thana District it is stated—"The seed-nuts are prepared in different ways. The best and oldest tree in the garden is set apart for growing seed-nuts. The nuts take from seven to twelve months to dry on the tree. When dry they are taken down, generally in April or May, or left to drop. When taken down they are either kept in the house for two to three months to let half of the water in the nut dry, or, if the fibrous outer shell is not dry, they are laid on the house-roof or tied to a tree to dry. After the nuts are dry, they are sometimes thrown into a well and left there for three months, when they sprout. If the nuts are left to drop from the tree, which is the usual practice in Bassein, they are either kept in the house for some time and then left to sprout in a well, or they are buried immediately after they have fallen. When the nuts are ready for planting they are buried either entirely or from one half to two thirds in sweet land, generally from 1 to 2 feet apart, and sometimes as close as 9 inches. A little grass, rice-straw, or dry plantain leaves are spread over the nuts to shade them. If white-ants get at the nuts the grass is taken away, and some salt or saltish mud mixed with wood ashes and a second layer of earth is laid over the nuts. Nuts are sometimes planted as late as August (*Shraavan*), but the regular season is from March to May (*Chaitra* and *Vaishakh*), when, unless the ground is damp and their inner moisture is enough for their nourishment, the nuts want watering every second or third day until rain falls. The nuts begin to sprout from four to six months after they are planted, and when the seedlings are a year or eighteen months, or, what is better, two years old they are fit for planting. At Bassein the price of seedlings varies from 5d (3 annas 4 pie) for a one or one and a half year old seedling, to 6d (4 annas) for a two-year-old plant. In planting them out the seedlings are set about six yards (12 *hats*) apart in the 2-foot-deep holes, in which about 1½ pounds (2 *tipris*) of wood-ashes have been laid to keep off white-ants, and the garden must be very carefully fenced to keep off cattle. The plants are then watered every second day, if not every day, for the first year, every third day, if not every second day, for the second and third year, and every third day, if possible, for the fourth and fifth year. Watering is then generally stopped, though some Bassein gardeners go on watering grown trees every seventh or eighth day. For two years after they are planted out the young trees are shaded by palm leaves or by growing *muthels* plantains. During the rains, from its fifth to its tenth year, a ditch is dug round the palm and its roots cut, and little sandbanks are raised round the tree to keep the rain water from running off. In the ditch round the tree, 22 pounds (4 *paylis*) of powdered dry fish manure (*kula*) is sprinkled and covered with earth, and watered if there is no rain at the time. Besides fish manure the palms get salt-mud (*Uthra chikhal*) covered with the leaves of the croton-oil plant, *jeplia* or *ind* (*Croton Tiglium*), and after five or six days with a layer of earth, or they get a mixture of cow-dung and wood-ashes covered with earth; or night-soil, which on the whole is the best manure. Palms suffer from an insect named *bhonga* which gnaws the roots of the tree, and from the large black carpenter-bee which bores the spikes of its half-opened leaves. When a palm is suffering from the attacks of the *bhonga*, a dark red juice oozes from the trunk. When this is noticed, a hole 3 inches square is cut in the trunk from 4 to 6 feet above where the juice is coming out, and is filled with salt, which dries away or kills the insect. To get rid of the boring bee, it is either drawn out by the hand, or it is killed by pouring in on the spike assafetida water or salt-water.

The Cocoa-nut Palm.

COCOS
nucifera.CULTIVA-
TION.

be a hundred.

"When the tree begins to
at the bottom of which is a
After about a fortnight the tr
perfection. Many of the young nuts also fall off, and only a few reach
maturity. A young nut is called *bonda*, a nut with a newly-formed ker-
nel is called *shale*, and a fully-formed nut *nârel*. A good tree yields three
or four times a year, the average number of nuts being about seventy-
five" (*Gaz.*, XIII, I, 295).

In the report of the Kâthiawâr District (*Bomb Gaz.*, VIII, p. 95),
there occurs a short but interesting account of the cocoa-nut: "At Ma-
huvâ, in 1875, 1,500 acres were planted with 170,000 palms. At Khandera
there is a garden with 7,000 palms, and there are about 2,000 at Bhânâ-
gar. The advantage of the cocoa-nut over the mango is the uniformity
with which it bears." "A singular fact about the cocoa-palm is that it
grows freely in solid limestone, provided a hole about 3½ feet deep by 3
ould. All the trees at

the cocoa-nut it may
etteers, there are from
100 trees to the acre.

Malabar, Kânâgiri, and Malabar appear to be the districts where the
largest number of trees occur. Of Râtnâgiri it is stated that it grows
for the first time only once every year, and not every year.

que
san
coasts,
in the s
neering:
plentiful.

II
Madras.
1531

formed from the description of the town of Cannanore, the clumps of the
cocoa-nuts being said "to be seen between the officers' houses, surround-
ing the cantonments in every direction, and extending in the distance as
far as the eye can reach, the cantonment may be said to be embedded in
a forest of these trees" (*Royle*). Of South Kânara, it has been estimated
that there are 80,000 acres under the cocoa-nut. Indeed, the Malabar
coast and the Laccadive and Maldive Islands are pre-eminently the
seats of the Indian cocoa-nut industry. The enquirer after Indian cocoa-
nuts, oil, or cocoa-nut oil, need practically concern himself with no other
part of the country unless he add to these the Nicobar Islands. The last-
mentioned islands furnish a very large number of cocoa-nuts, but appa-
rently the islanders are ignorant of, or too indifferent to earn, the art of
making oil or expressing the oil. So far this remark seems to be almost
applicable to the Maldives also, a group of large islands under a Sultan,
who is subordinate to the Governor of Ceylon, and not to the Viceroy
of India. This fact is of some importance, since the casual examination
of the trade returns might convey the idea that the Laccadives export no
oil, if the still further error might not even be committed of supposing
the Laccadives to contain no cocoa-nuts at all. The Laccadives are
mainly under the administration of the Collector of Malabar, and the im-
ports from these islands are treated as if they were produce of the main-

COCOS
nucifera

The Cocoa-nut Palm.

CULTIVA-
TION

land, while the imports from the Maldives are returned as from foreign territory. Last year the Maldives sent 7,897,453 cocoa-nuts to India, and the Nicobar Islands 4,510,000. Of the inhabitants of these groups of islands it is not reported that they manufacture coir, and apparently they prepare only a small amount of copra, although they sell their nuts at a price far below that which prevails on the mainland of India.

1532

Writers in Europe, who have described the commercial article Coir, are in the habit of placing the coir from Cochin in the first rank. Some doubt seems to be associated, however, with the commercial term "Cochin Coir." The small Native State probably alluded to is described in the *Imperial Gazetteer* as "possessing no important trade by sea or land." It seems impossible to believe that all the coir returned under the name of "Cochin Coir" could therefore come from Cochin. Indeed, the suspicion exists that the better class of Malabar and Laccadive coir, consigned to Europe, may be so designated, if not also some of the exports of coir from Cochin-China and the Straits. In the returns of the coasting trade for British India it is shown that last year the total exports of coir from Cochin by sea amounted to only 689 cwt, valued at Rs. 134, and manufactured coir 2,777 cwt, valued at Rs. 339. These were all sent to Bengal or Bombay, how much may have gone by land to Madras cannot be discovered. It is significant that Dr. Shortt in his *Monograph on the cocoa-nut palm*, which has just appeared, makes no mention of Cochin coir.

1533

Repeated reference will have to be made, in subsequent pages, to the Laccadive and Malabar coir and the other cocoa-nut products from these regions, so that we shall here content ourselves with this brief notice of Madras concluding only by giving the description of the cultivation given in *Morris's Descriptive and Historical Account of the Godavery District*: "Young plants of a year's growth are planted out, and watered for six years, after which they do not require much water. The trees generally bear fruit about the ninth year after transplantation. The expenses of cultivation are stated to be Rs. 668 for a *putti* of land,—namely, Rs. 140 being the price of 600 young plants, Rs. 48 being the value of the labour required for planting them and Rs. 480 being the wages of labourers employed to water and tend the trees until they come into bearing. When the trees begin to bear fruit, the value of the produce of a tree exclusive of the fibre is estimated at about 12 annas a year, making the total value of the produce in a *putti* of land Rs. 300" (p. 70).

III In Mysore "there are four varieties of the coconut: 1st, red; 2nd, red mixed with green, 3rd, light green, and 4th, dark green. These varieties are permanent, but although the red is reckoned somewhat better than the others, they are commonly sold promiscuously. Their produce is nearly the same.

"The soil does not answer in the Bangalore district unless water can be had on digging into it to the depth of 3 or 4 cubits, and in such situations a light sandy soil is the best. The black clay, called *ere*, is the next best soil. The worst is the red clay, called *kebbe*, but with proper cultivation all the three soils answer tolerably well.

"The manner of forming a new cocoa-nut garden is as follows. The nuts intended for seed must be allowed to ripen until they fall from the tree, and must then be dried in the open air for a month without having the husk removed. A plot for a nursery is then dug to the depth of 2 feet, and the soil is allowed to dry three days. On the Ugadi feast (in March) remove 1 foot of earth from the nursery and cover the surface of the plot with 8 inches of sand. On this, place the nuts close to each other, with the end containing the eye uppermost. Cover them with 3 inches of sand and 2 of earth. If the supply of water be from

C. 1534

III
Mysore
1534

The Cocoa-nut Palm.

COCOS
nucifera.CULTIVA-
TION

a well, the plot must once a day be watered, but if a more copious supply can be had from a reservoir, one watering in the three days is sufficient. In three months the seedlings are fit for being transplanted. By this time the garden must have been enclosed, and hoed to the depth of 2 feet. Holes are then dug for the reception of the seedlings at 20 feet distance from each other in all directions, for when planted nearer they do not thrive. The holes are 2 feet deep and a cubit wide. At the bottom is put sand 7 inches deep, and on this is placed the nut with the young tree adhering to it. Sand is now put in until it rises 2 inches above the nut, and then the hole is filled with earth and a little dung. Every day for three years, except when it rains, the young tree must have water.

"The cocoa nut palm begins to produce when seven or eight years old, and lives so long that its period of duration cannot readily be ascertained. Young trees, however, produce more fruit which comes forward at all seasons of the year. A good tree gives annually a hundred nuts. A few are cut green on account of the juice, which is used as drink, but by far the greater part are allowed to ripen."

"Co
areca-nu
the cult
the situation for these gardens must be rather low, but it is not necessary that the place will answer in which water can be raised. The ch is with howe is reckoned very bad. The cocoa-nut

second day for six months the seed must be watered with a pot, and then the young palms are fit for being transplanted. Whenever, during

the water gives
ough five
following
and next
must be
Coco-nut palm wide and as much deep. In the bottom of each a little
dung is put, and the young plants, having been previously well watered
to loosen the soil, are taken up and one is placed in each pit. The shell
earth so
months
s every
After-

wards they require no water.

"Every year the garden is cultivated for *ragi*, *uddu*, *hesaru*, or whatever other grain the soil is fitted for, and is well dunged, and at the same time four ox-loads of red mud are laid on the garden for every tree that it contains. While a little fresh earth is gathered up towards the roots of the palms. The crop of grain is but poor, and injures the palms, it is always taken, however, as, in order to keep down the weeds, the ground must at any rate be ploughed, as the manure must be given and as no rent is paid for the grain. On this kind of ground the cocoa-nut palm begins

COCOS
nucifera.

The Cocoa-nut Palm.

CULTIVA-
TION

to bear in twelve or thirteen years, and continues in perfection about sixty years. It dies altogether after bearing for about a hundred years. They are always allowed to die, and when they begin to decay a young one is planted near the old one to supply its place.

"In this country, wine is never extracted from this palm, for that operation destroys the fruit, and these when ripe are considered as the valuable part of the produce. A few green nuts are cut in the hot season, on account of the refreshing juice which they then contain, and to make coco rope; but this also is thought to injure the crop. The oil made from the ripe nuts is very bad, and their husks are commonly burned for fuel.

"The crop begins in the second month after the summer solstice, and continues four months. A bunch is known to be ripe when a nut falls down, and it is then cut. Each palm produces from three to six bunches, which ripen successively. A muddling palm produces from 60 to 70 nuts. As the nuts are gathered they are collected in small huts, raised from the ground on posts. When a merchant orders, the rind is removed at his expense, by a man who fixes an iron rod in the ground, and forces its upper end, which is sharp, through the fibres, by which means the whole husk is speedily removed. He then, by a single blow with a crooked knife, breaks the shell without hurting the kernel, which is then fit for sale and is called *loppari*. A man can daily clear 1,300 nuts. From 20 to 30 per cent of them are found rotten" (*Mysore Gov. I.*, 131-134).

IV
Nicobar
Islands.
1535

IV. On the Nicobar Islands the cocoa-nut palm is very abundant, although, as already stated, it exists only under recent cultivation on the Andaman Islands, but reappears still further to the north on the group of the Cocos Islands. Sir W. W. Hunter gives an interesting account of the Nicobar trade in cocoa-nuts which may be here quoted. "At present the principal product of these islands is the cocoa-nut palm, and its ripe nuts form the chief export." "The northern islands are said to yield annually in million cocoa nuts, of which about half are exported. The estimated number exported in 1881-82 was 4,570,000. As this important product is six times cheaper here than on the coast of Bengal or in the Straits of Malacca, the number of English and Malay vessels that come to the Nicobars is every year increasing." "The trade in cocoa-nuts is carried on chiefly by native craft from Burma, the Straits Settlements, Ceylon, &c. Forty vessels of an aggregate tonnage of 6,270 tons visited the islands for cocoa-nuts in 1881-82." "The Administration Report for 1885-86 gives the exports as 4,510,000 nuts and 5,730 bags of copra. In that year 49 vessels, with an aggregate tonnage of 8,218 tons, obtained permission to trade with the Nicobar Islands for cocoa-nuts, &c. The same report states that there are now 112,000 cocoa-nut palms under cultivation at Port Blair.

V.
Burma
1536

V. Of Burma it is reported that the cocoa-nut is "largely cultivated, and might be much more so in many places along the Arakan coast as it is in Ceylon, and as doubtless it would be but for the sparseness of population, the difficulties of approaching the coast except at a few spots, and the absence of the means of land communication between the ports and the sites fitted for the production of the trees." In the Bassein district of Pegu it has been stated that there are 10,000 acres under cocoa nuts.

VI
Bengal.
1537

VI. In Bengal, while the palm is plentiful throughout the lower Gangetic basin, it exists only in garden cultivation, and the produce is not much in excess of the local demand. There are no large plantations such as have been described in Madras, Mysore, and Bombay, because in Bengal the date-palm is used as the source of palm juice or toddy and not the cocoa-nut. It is, however, fairly abundant in Noakhali, Backerganj, Jessore, and the 24 Parganas.

The Cocoa-nut Palm.

COCOS
nucifera.CULTIVA-
TION.

V.

VII. In Upper India the cocoa-nut is alluded to in many works, but only as an article of import and export; it is not cultivated. Dr. Hartwig (*Tropical*
damp wa
and grow
the trees
forth no

to bend over the rolling surface, and to drop its fruits into the tidal wave.

are covered an inch
berch, and watered
white shoot contain-
ing the foliaceous rudiments springs from one of the three holes in the

VIII.
Ceylon.
1539

remains within the nut forming a sort of arm of attachment. The lower

ENEMIES TO THE COCOA-NUT.

It is commonly stated that if the soil be too rich a large grub with a reddish-brown head soon finds its way to the roots and into the stem. This eats its way through the tissues until the leaves turn yellow, the terminal bud withers, and the tree is killed. This appears to be the beetle known as *Autocera rubra*. "In the Straits of Malacca, the chief natural enemy of the tree is a species of elephant-beetle, which begins by nibbling the leaves into the shape of a fan; it then perforates the central pithy fibre, so that the leaf snaps off, and lastly, it descends into the folds of the upper shoot, where it bores itself a nest, and, if not speedily extracted or killed, soon destroys the tree. A similar kind of beetle is known on the Coromandel coast, and is extracted by means of a long iron needle or probe, having a barb like that of a fish-hook. By using this and by pouring salt or brine on the top of the tree, so as to descend amongst the folds of the upper shoots, the evil may be prevented

1540

1541

1542

COCOS
nucifera.CULTIVA-
TION

The Coconut Palm.

to bear in twelve or thirteen years, and continues in perfection about sixty years. It does not get better after bearing for about a hundred years. They are always all well to do, and when they begin to decay a young one is planted near the old one to supply its place.

"In this country, wine is never extracted from this palm, for that operation destroys the fruit, and therefore when it is considered as the valuable part of the produce. A few green nuts are cut in the hot season, on account of the refreshing juice which they then contain, and to make a cord rope; but this also is thought to injure the crop. The cord made from the ripe nuts is very bad, and their husks are commonly burned for fuel.

"The crop begins in the second month after the summer solstice, and continues four months. A bunch is known to be ripe when a nut falls down, and it is then cut. Each palm produces from three to six bunches, which ripen successively. A middling palm produces from 60 to 70 nuts. As the nuts are gathered they are collected in small huts, raised from the ground on posts. When a merchant desires, the rind is removed at his expense, by a man who fixes an iron rod in the ground, and forces its upper end, which is sharp, through the fibres, by which means the whole husk is speedily removed. He then, by a single blow with a crooked knife, breaks the shell without hurting the kernel which is then fit for sale and is called *kappan*. A man can thus strain 1,200 nuts. From 20 to 30 per cent of them are found rotten" (*Mysoor Gazette* 1831-32).

IV On the *Andaman Islands* the coconut palm is very abundant, although as already stated, it exists only under recent cultivation on the Andaman Islands but reappears still further to the north on the group of the Cocos Islands. Sir W. W. Hunter gives an interesting account of the Nicobar trade in cocoanuts which may be here quoted. "At present the principal product of these islands is the coconut palm, and its ripe nuts form the chief export." "The northern islands are said to yield annually 10 million cocoanut nuts, of which about half are exported. The estimated number exported in 1881-82 was 4,570,000. As this important product is six times cheaper here than on the coast of Bengal or in the Straits of Malacca, the number of English and Malay vessels that come to the Nicobars is every year increasing." "The trade in coconut nut is carried on chiefly by native craft from Burma, the Straits Settlements, Ceylon, &c. Forty vessels of an aggregate tonnage of 6,270 tons visited the islands for cocoanuts in 1881-82." The Administration Report for 1885-86 gives the exports as 4,510,000 nuts and 5,730 bags of copra. In that year 49 vessels, with an aggregate tonnage of 8,218 tons, obtained permission to trade with the Nicobar Islands for cocoanuts, &c. The same report states that there are now 112,000 coconut nut palms under cultivation at Port Blair.

V Of *Burma* it is reported that the coconut is "largely cultivated, and might be much more so in many places along the Arakan coast as it is in Ceylon, and as doubtless it would be but for the sparseness of population, the difficulties of approaching the coast except at a few spots, and the absence of the means of land communication between the ports and the sites fitted for the production of the trees." In the Bassein district of Pegu it has been stated that there are 10,000 acres under coconut nuts.

VI In *Bengal*, while the palm is plentiful throughout the lower Gangetic basin, it exists only in garden cultivation, and the produce is not much in excess of the local demand. There are no large plantations such as have been described in Madras, Mysore, and Bombay, because in Bengal the date-palm is used as the source of palm juice or toddy and not the coconut. It is, however, fairly abundant in Noakhali, Backerganj, Jessore, and the 24 Parganas.

The Cocoa-nut Palm

COCOS
nucifera.CULTIVA-
TION
VII
Upper India
1538

VII. In Upper India the cocoa-nut is alluded to in many works, but only as an article of import and export, it is not cultivated. Dr Hartwig (*Tropical World*) says: "This noble palm requires an atmosphere damp with the spray and moisture of the sea to acquire its full stretchiness and growth, and, while along the bleak shores of the Northern Ocean the trees are generally bent landward by the rough sea breeze, and send forth no branches to face its violence, the cocoa, on the contrary, loves to bend over the rolling surface, and to drop its fruits into the tidal wave. Wafted by the winds and currents over the sea, the nuts float along without losing their germinating power, like other seeds which migrate through the air, and thus, during the lapse of centuries, the Cocoa-palm has spread its wide dominion from coast to coast, through the whole extent of the tropical zone."

VIII
Ceylon
1539

VIII. Ceylon.—Speaking of Ceylon cultivation Mr Treloar says: "The ripe nuts are first planted in a nursery, where they are covered an inch deep with sand and sea weed or soft mud from the beach, and watered daily til they germinate. In two or three months a white shoot containing the foliaceous rudiments springs from one of the three holes in the end of the nut, the radicals emerging from the other two orifices opposite to the shoot, and penetrate the ground." This is not quite a correct description of the germination. The leaf-stalk of the cotyledon elongates and pushes the embryo bodily out of the seed. The blade of the cotyledon remains within the nut forming a sort of arm of attachment. The lower point of the projected embryo elongates and forms the roots, and from a slit in the cotyledonar sheath the plumule or stem makes its appearance. The "three holes" on the nut are all close together, not "opposite" as in the above description and are only spots not holes. But Mr Treloar proceeds: "The nuts set in April, grow large enough in about four months to be planted out before the annual rains, but for the next two or three years or more the young plants require constant care. They must be watered and shaded from the glare of the sun by screens of plaited leaves from the cocoa-nut tree or the fan-shaped fronds of the palmyra."

ENEMIES TO THE COCOA-NUT.

It is commonly stated that if the soil be too rich a large grub with a reddish-brown head soon finds its way to the roots and into the stem. This eats its way through the tissues until the leaves turn yellow, the terminal bud withers, and the tree is killed. This appears to be the beetle known as *Butocera rubus*. In the Straits of Malacca, the chief natural enemy of the tree is a species of elephant beetle, which begins by nibbling the leaves into the shape of a fan, it then perforates the central pithy fibre, so that the leaf snaps off, and lastly, it descends into the folds of the upper shoot, where it bores itself a nest, and, if not speedily extracted or killed, soon destroys the tree. A similar kind of beetle is known on the Coromandel coast, and is extracted by means of a long iron needle or probe, having a barb like that of a fish-hook. By using this and by pouring salt or brine on the top of the tree, so as to descend amongst the folds of the upper shoots, the evil may be prevented or got rid of. This destructive beetle is known to entomologists as *Calandra palmorum*, but still another beetle bores round holes into the stem itself and lives there. Rats, flying-foxes, and squirrels injure the tree and sometimes kill it by eating the tender terminal bud or cabbage. It is equally necessary to protect the trees from wild hogs, elephants, cows, porcupines, all of which graze on the young plants. But of the dangers to which the cocoa nut is subject none are so great as the attacks of beetles, two of which are alluded to above. Mr. Treloar says of Ceylon: "Still

1540

1541

1542

COCOS
nucifera.

The Cocoa-nut Palm: Coir Fibre.

CULTIVA-
TION

1543

1544

1545

GUM

1546

DYE

1547

1548

1549

1550

COIR FIBRE.

1551

Leaf-Stalks

1552

Tomentum

1553

Coir

1554

more formidable is the *coccinella* beetle (*Harporina rubra*), which was to pierce the tender trunk near the ground, and to deposit its eggs in the cavity whence the young grubs, directly they are hatched, begin to eat their way up through the centre of the tree to the young leaf-buds at the top. The devastation is often very great. The Burmans are great adepts at detecting the beetles in date and cocoa-nut palms and extract them as prized articles of food.

GUM.

The stem of this well-known tree is in Tahiti said to yield gum. It forms large stalactitic masses, red-brown, translucent or transparent. (*Spon's Encycl.*) Cooke, in his report on Gum and Gum-resins, says that this gum was sent to the Madras Exhibition of 1855 from Travancore. No other author appears to allude to this gum however, and it therefore, seems probable that if produced it is met with only in certain localities. The writer cannot recollect ever having seen a gum adhering to the stems of the palm.

DYE.

"In a patent obtained by Mr. J. H. Baker (No 5139, March 29th 1825) the whole or every part of this tree is claimed as a dye-ware, especially the husk enclosing the fruit, and the foot-stalks of the leaves. The dye was to be extracted by water, cold or boiling, or by solutions of lime, potash, ammonia, &c., and was to serve for dyeing nankeens, blue-blacks, &c. The infusion was likewise to serve as a substitute for nut-galls in Turkey-red dyeing. The material does not appear ever to have come into practical use." (*Crookes*.)

Mr. Llotard says of this dye property: "Produces a dirty-brown colour, and is much used from its abundance. Lime and Drury remarks that "the shell when burnt fine powder and mixed with *chunam* is used for painting. Cocoa-nut oil is frequently employed in

certain processes
sulphate of iron
colour to silk.
pose of the coco-

are aware of the dye pro-
lasterers both in India
ne or colour-washes it
For this purpose
ements (see No. 1626

and also the article Cement, C. No 503.

COIR FIBRE

The thick pericarp or outer wall of the fruit yields the valuable COIR FIBRE of commerce. The SHEATHS of the leaves are used to wrap up articles, and as paper to write upon. At the Colonial and Indian Exhibitions the coir has been used as a means of strength.

important fibre yielded by the cocoa-nut palm is of course COIR. The name

C. 1554

COCOS
nucifera.

The Cocoa-nut Palm. Coir Fibre.

PROPERTIES
OF
COIR.

If cut earlier than this, the fibre is weak, if later, it becomes coarse and hard, requires a longer soaking, and is more difficult to manufacture." Dr. Buchanan Hamilton in his journey across Mysore states (*I*, 156) the green cocoa nuts are sold for their husks, from which fibre is extracted, but the husks of the ripe cocoa-nuts are commonly burnt for fuel (*II*, 50). At the same time immense quantities of apparently ripe cocoa-nuts, in husk, are sent to Europe, the coir from the husk being there separated, cleaned, and manufactured. Mr Jackson of Kew, in the *Planters' Gazette*, describing a visit to Messrs Chubb, Round & Co's factory, gives an interesting account of the process of husking there pursued. He says "The enormous heap of husks—which, indeed, is known in the locality as the 'mountain'—comes upon view immediately upon entering the premises, and one can scarcely, at first sight, realise the fact that the enormous pile is composed entirely of these apparently useless portions of the fruit. At the time of my visit this reserve stock of husks was estimated at considerably over a million and a half." Cocoa-nuts, or, as they are generally termed in the trade, "Cocker-nuts," to distinguish them from the *Theobroma* *Cacao*, which furnishes cocoa and chocolate, are shipped principally from Trinidad, Jamaica, Demerara, Tobago, several of the other Leeward Islands in the British West Indies, Ceylon, Belize (British Honduras), all round the coast of America, and the Fiji Islands. Nearly all the nuts are imported in the husk or outer covering, from which, on arrival, they are stripped by men using two fine pointed steel chisels, and who, by constant practice, become so skilful in the art that many are able to open 1,000 to 1,200 nuts per day. The nuts themselves after being removed from the husks are generally sold to wholesale fruit dealers, who, in turn, supply the retailers, costermongers and others, &c." In the above passage Mr Jackson has furnished the Indian people with new ideas. India is not enumerated by him as one of the countries that furnish cocoa nuts to England, the fibre of what appear to be mature cocoa nuts is actually used, the consumption of cocoa nut kernel has in England attained a vast proportion and the fibre can be cleaned after apparently having been kept for years on the nut. These facts open up a new field of trade of which with a little assistance the Nicobar and Laccadive Islands might profitably and without fear of any rival hope to enjoy a large share.

SEPARATION
OF COIR.
1556

Separation of Coir in India.—"The removal of the fibre from the shell is effected by forcing the nut upon a pointed implement stuck into the ground, in this way a man can clean 1,000 nuts a day. The fibrous husks are next submitted to a soaking, which is variously conducted. In some places they are placed in pits of salt or brackish water, for 6 to 18 months, in other places, fresh water is used, but it becomes foul and injures the colour of the fibre. The chief point to be considered is the duration of the soaking, if it be continued too long, the fibre will be weakened; if it be curtailed, the subsequent extraction and cleansing of the fibre will be rendered more difficult. The most approved plan of conducting the soaking is in tanks of stone, brick, iron, or wood, steam is admitted to warm the water. By this means the operation is rendered very much shorter, and the fibre is softened and improved. The further separation of the fibre from the husk is largely effected by hand. After thorough soaking, the husks are beaten with heavy wooden mallets, and then rubbed between the hands." (*Spon's Encyclop.*, Royle and Marshall give the same facts.)

Robinson describes the separating and cleansing of the fibre as practised in the Laccadive Islands as follows "When soaked sufficiently long, it is taken out of the pit and beaten with a heavy mallet. Subsequently it is said to be rubbed with the hands until all the interstitial

The Cocoa-nut Palm Coir Fibre.

COCOS
nuciferaSEPARATION
OF COIR.

cellular substance is separated from the fibrous portion. When quite clean it is arranged into a loose roving preparatory to being twisted, which is done between the palms of the hands in a very ingenious way, so as to produce a yarn of two strands at once."

"As the husk gets hard and woody if the fruit is allowed to become quite ripe, the proper time for cutting it is about the tenth month. If cut before this, the coir is weak, if later, it becomes coarse and hard, and more difficult to twist, and requires to be longer in the soaking pit, and thus becomes darker in colour. When cut, the husk is severed from the nut and thrown into soaking pits. These, in some of the islands, are merely holes in the sand, just within the influence of the salt water. Here they lie buried for a year, and are kept down by heaps of stones thrown over them to protect them from the ripple. In others, the soaking pits are fresh water tanks behind the crest of coral. In these, the water, not being changed, becomes foul and dark coloured which affects the colour of the coir. When thoroughly soaked, the fibrous parts are easily separated from the woody by beating. If taken out of the pits too early, it is difficult to free the coir from impurities, if left in too long, the fibre is weakened, as is said to be the case also with that soaked in fresh water" (*Robinson's Report on the Laccadives*). In the Maldives (neighbouring islands under the suzerainty of the Governor of Ceylon) cocoanuts are very plentiful, and enormous quantities of both the nut and the fibre are exported to India and Ceylon. (*See the further paragraph on trade in nuts*)

From what has been said in an early paragraph regarding the cultivation of the cocoa nut palm in Mysore, it will be seen that the opinion

On the other hand Royle says "But the fruit bearing power of the trees may be considerably improved by extracting toddy from the blossom shoots for the manufacture of jaggery during the first two years of its production after which it may be discontinued." In the Konkan the opinion is held that "if tapped the trees become unproductive much sooner."

The Bombay process of extracting the fibre is briefly described in the *Bombay Gazetteer* of the Thana district "The fibrous part of the outer coating is made into coir by the Bassein gardeners. For this purpose the fibres are stripped from the nuts left under water for two months, and then beaten by a wooden mallet." The writer cannot discover any detailed description of the process adopted in India generally (except that of the Laccadives) for the separation, steeping, and cleaning of the fibre, but to the best of his knowledge it agrees with what has already been given, although in the Laccadives the Malabar Coast, Ceylon, and other important coir producing countries the art is carried to greater perfection, the fibre being processed to a high degree of purity. India, from the Ceylon, are

chi, and it seems possible that a coir industry might there be developed. It has been reported that in Madras cocoa nut cultivation has been successfully prosecuted in the reclamation of salt impregnated lands where

COCOS
nucifera.

The Cocoa-nut Palm : Coir Fibre.

nothing else would thrive. (*Gen. Admin. Report, p. 95*) A curious fact in regard to coco-nuts grown on salt marshes is conveyed by the following passage:—

"The cocoa-nuts growing in mangrove soils, on the side of creeks, and more or less saturated with salt, have their milk brackish, and the sap is saline also. These trees do not suffer from the attacks of the rhinoceros-beetle, and are found to bear much sooner than those planted in a sandy soil" (p. 182-83).

TRADE IN
COIR
1557INTERESTING FACTS CONNECTED WITH THE TRADE IN INDIAN COIR
(*Conf. with p. 435*).

Although, as suggested, the better class fibre is most likely not produced where tapping for the juice is practised, still it should not be forgotten that the Malabar ports are the chief seats of the export of coir from India. In most works the statement is made that the Cochin or the whole of the Malabar coast is meant, or whether Cochin coir is a mere commercial term for all good coir wherever obtained. In the Indian regions alluded to a considerable extent. Of the most important article, but Dr. Shortt (*in his Monograph on the Cocoa-nut Palm*) does not apparently mention Cochin coir. He states that the best Madras coir comes from the Laccadives, Amindivi, Kadamat, Kiltan, and Chettat. As indicated by the passage quoted above from Mr. Jackson's paper Messrs Chubb, Round & Co do not, it would seem, use any Cochin fibre but prefer a husk which they separate from a mature or at least edible nut.

In a recent report on the trade of Madras, the progress of the coir industry of that presidency for the past twenty-five years is shown. The average exports to foreign and Indian ports for the five years ending 1860-61 were 148,220 cwt, valued at Rs. 74,804, and for the five years ending 1880-81, they were 271,931 cwt, valued at Rs. 1,79,767, while for the year 1881-82 they were Rs. 23,54,202. Of the last mentioned valuation, the exports from the Malabar coast alone amounted to Rs. 22,43,000. From these figures a definite idea may be obtained of the immense importance of Malabar and the Laccadives as the chief seats of the Indian coir industry, since the Madras Presidency heads the list of Indian exports.

form of the palm grown in the Island of Kiltan, Royle observes: "It requires no attention and comes into bearing early. The tree is not so large."

The nut is also said to be more compact and oily, and to keep better than the coast nut, although, for the sake of the coir, the nut is cut before being quite ripe." How far the exports of coir from the Malabar coast correspond to Indian-grown coir cannot be discovered. The Northern Laccadives are administered by the Collector of Malabar and the Southern by Ali Raj of Cannanore. Sir W. W. Hunter in the *Imperial Gazetteer* (VIII, 324) says: "The article (coir) is paid for to the producers at fixed prices, and is sold on the coast at the market rates; the difference constitutes the revenue or profits of trade of the Government and Ali Raj respectively. The latter pays a fixed tribute of Rs. 10,000 (£1,000) to the

The Cocoa-nut Palm: Coir Fibre.

COCOS
nucifera.

Government on account of the islands which he manages. No change has been made for many years in the price which is given by Government for the coir produced in the islands attached to Kánara." The returns of the coasting trade of India do not specify the amounts of coir sent from the Laccadives to Malabar, so that the somewhat interesting subject of how far the juice-extracting industry of the coast is combined with the preparation of fibre cannot be definitely learned. The following facts are, however, instructive.

IMPORTS of coir (manufactured and unmanufactured) into Madras from other Indian ports—

	Cwt.	R
1854-55	14,745	95,884
1856-57	13,750	81,386

Imports.
1558

EXPORTS to other Indian ports—

	Cwt.	R
1854-55	186,869	12,66,356
1856-57	128,228	7,98,255

Exports.
1559

Turning to the tables that give the details of these figures, it is shown that of raw or unmanufactured coir Madras receives none from British or foreign Indian ports, so that unless the Laccadives, which (as stated

of the
in the
of the
acts is
trade
be any
s that
cheap
home
It may
made

to instruct the natives of the Nicobars in the art of preparing the coir fibre— an art so profitably practised by their neighbours, the islanders of the Laccadives. This is indeed one of the most hopeful aspects of a possible enhanced Indian trade in coir, until such time as the cultivation of the palm can be more vigorously prosecuted along the Coromandel coast to Burma. It seems remarkable that the cheap cocoa-nuts sold in the Nicobar Islands should attract traders from Ceylon and the Straits, while India appears to make little or no effort to participate in the advantages of that trade.

YIELD PER NUT OF FIBRE AND PRICE.

YIELD OF
FIBRE.
1560

Mr. Robinson, in his *Report on the Laccadives*, states that the difference in the quantity of coir manufactured from a coast nut and from an island nut is 12 to 1. The coast nut yields 6 lb. of coir, while the island nut yields 1 lb. of coir.

coast nuts will
fine island nuts go to about 100 lb. of coir, but this will measure 35 fathoms; 2 lb. of such yarn, measuring from 70 to 75 fathoms, are made up into 100 ties, of which there are 14 to a bundle, averaging about a maund of 28 lb. A

C. 1560

COCOS
nucifera

The Coconut Palm: Coir Fibre.

PRICE
1561

Mangalore candy of 56lb will thus be the produce of 5 600 nuts and should contain about 20,000 fathoms of yarn. The actual price of coir received by the islanders is about R13 per candy. The value of the coir produce of 1 tree is calculated to be from 2 to 2½ annas, and that of the produce of 100 trees from R13 to 15. "The average value of the total raw produce of 1 tree bearing fruit would then be seven annas to half a rupee, and that of a plot of 100 trees, R45." For the nuts which they export to the Malabar coast they get from R7 to 10 per thousand, or rather 1,100, 75 to per cent is always allowed for luck in these sales. The islanders export from 300,000 to 400,000 nuts annually. The natives bring their coir to the coast in March and April, which is then received into the Government godowns. Until the year 1820 all coir was paid for at the rate of R21-14-0 per Mangalore candy, or R25 per Calicut candy of 640lb. After that year the coir was divided into three classes. Since then the average price paid for a Mangalore candy of Amceendey and Kadamat coir has been R20-2-0 (or R23 per Calicut candy of 640lb). But for the Kutan and Cheilat coirs, which are the best, an average of R20-12-7 or R23-12-0 per Calicut candy is paid. Up to A D 1825-26, the Bombay and Bengal Governments took almost the whole of the coir brought from these islands, and credited the Mangalore Collectorate with R25 per candy. The price has since fallen very much during the last twenty years. It has been frequently below the price paid to the islanders, and at best has never yielded above 12 to 20 per cent profit. The average imports of coir have been from 500 to 600 candies. Mr Morris, in his account of the Godavery district, Madras, gives the following brief statement regarding the production and yield of coir—

"The coconut nut tree yields an excellent fibre. The quantity of fibre in the above extent of land (a *putti*) is estimated at 150 maunds, yielding R93-12-0, at 10 annas 1 maund. The fibre is prepared by the outer covering of the coconut-nut being moistened and beaten with wooden mallets, after the fibre has thus been loosened. The coir thus obtained is twisted into ropes. The fruit is exported, but very little of the fibre." (*Morris's God Dist.*, 70)

Spon's Encyclopaedia gives the London prices of coir as "Cochin—good to fine, £19 to £25 a ton, coarse, £16-10s to £19-15s. Yarn—good to fine, £26-10s to £46 a ton, medium, £21-5s to £28-10s, common, £14 to £22 10s, roping, £18 to £24."

USES OF
COIR
1562

USES OF COIR.

"The fibrous husk of the cocoa-nut is not its least valuable product, and gives rise to a very large trade, both in the East and in Europe. At first it was only used in this country (England) for stuffing mattresses and cushions, but its applications have been enlarged and its value greatly increased by mechanical processes, and in a small pamphlet issued by Mr Treloar, more than twenty years ago, he stated that its natural capabilities having been brought out, coir has been found suited for the production of a variety of articles of great utility and elegance of workmanship—table mats, fancy baskets, and bonnets, &c. Instead of being formed into rough cordage only and mats made by hand by means of ingeniously-constructed machinery the fibre is rendered sufficiently fine for the loom, and matting of different textures and coloured figures is produced, while a combination of wool in pleasing designs gives the richness and effect of hearth-rugs and carpeting. Brushes and brooms for household and stable purposes matting for sheep-folds, pheasantries, and poultry yards, church cushions and hassocks, hammocks, clothes lines, cordage of all sizes, and string for nurserymen

1563

The Cocoa-nut Palm: Coir Fibre.

COCOS
nucifera.

and others, for tying up trees and other garden purposes; nosebags for

USES OF
COIR.

1564

invaluable as being in a damp
employed in tying the bamboos

14.—A brief
The finer
ntly put to
for paper-

Fibrous
Sheaths.
1565

making. They might be used to strengthen saddlery, and even for ladies' corsets and splints. Knox says of Ceylon that "the filaments at the bottom of the stem of the cocoa-nut may be manufactured into a coarse cloth called *gunny*, which is used for bags and similar purposes."

On the young sheaths and petioles a brown-coloured cotton or tomentum will be seen similar to that already described under *Borassus flabelliformis* (B. 680). This is sometimes collected and used by the

Cadjans.
1566

cocoa-nut leaf. These mats are of fine quality and much esteemed when employed for the sails of the smaller FRONDS in halves, and plait the leaflets they form the usual covering of their huts, as well as of the bungalows of the Europeans. "The dried fronds are sometimes used as torches or for fuel, their midribs, tied together, are sometimes used as brooms for the decks of ships, as the fibres of the stalk are woody, brittle, and difficult to clean." (Royle)

Fronds.
1567

COLLECTIVE TRADE IN COCOA-NUT PRODUCTS.

This trade, as with every other article of Indian produce or manufacture, is referable to three great sections (a) internal trade or local consumption, (b) inter-provincial trade adjusting the balance of local demand, and (c) foreign trade (e.g., imports and exports) to and from India and other countries. Where the cocoa-nut grows it is of such importance and enters so largely into the daily life of the people, that little or nothing can be ascertained of the actual consumption. The returns of road, river, and rail traffic throw some light on this, and the coasting trade affords another means of arriving at an approximate estimate of a certain proportion, but even these returns fall far short of establishing a tangible conception of the total local consumption. Wherever the palm grows, each villager, as a rule, has some trees, the produce of which is used up by himself or sold to his less fortunate neighbours, without having to go many yards from the spot where produced. At the same time, a considerable amount of the inter provincial exchange must necessarily figure again under foreign exports, or at most re-exports, so that while the returns of foreign trade indicate but a very small proportion of the production, it would be unsafe to reckon these up with the available returns of coasting and inter-provincial trade. To give some idea of the present position and

TRADE IN
COCOA-NUT
PRODUCTS
1568

COCOS
nucifera.

Trade in Cocoa-nut Palm Products.

TRADE.

growth of the trade in the cocoa-nut palm it will not be necessary to go further back than the year 1850. Royle, in his *Fibrous Plants of India*, gives the imports and exports for that year compiled from the records of the following statement:—

All published Imports and Exports for 1850.

	Imports.	Exports.
	<i>R</i>	<i>R</i>
Nuts	5,24,889	10,140
Kernels	8,66,120	4,31,003
Coir and rope	2,31,934	2,84,514
Oil	76,648	1,51,843
Shells	5,970	Nil
Cadjans	2,990	Nil
TOTAL	17,08,551	8,77,505

This gives a grand total of *R*25,86,056; that is to say, less than the foreign imports of last year. To compare with the above statement of **TOTAL TRADE**, the following table of the **FOREIGN TRADE** for 1886-87 (exclusive of all internal and inter-provincial or coasting traffic) may be given:—

Foreign Imports and Exports for 1886-87.

	Imports.	Exports.
	<i>R</i>	<i>R</i>
Nuts	5,98,203	8,462
Copra (or kernels)	11,76,799	79,836
Coir (unmanufactured)	6,839	77,391
Oil (manufactured but exclusive of ropes)	7,50,701	19,14,448
Oil	7,54,515	13,24,589
TOTAL	26,87,057	34,04,726

If to the above table of foreign trade we were to add the returns (included by Royle) of coasting trade from Malabar, the Laccadives, Coromandel, Konkan, & but, as the table of cocoa-nut whereas in 1887 they were coasting feature of manufactured coir a

ports of cocoa-nuts and oil copra or tationary during can be accepted owing statement

The Cocoa-nut Palm.

COCOS
nucifera.

TRADE.

of the values of the coasting trade in cocoa-nut products during the year 1886-87:—

Coasting Trade in	Imports.	Exports.
	₹	₹
Nuts	24,21,941	16,88,773
Kernels (copra)	35,31,115	23,00,958
Coir	12,26,749	9,27,392
Oil	20,60,667	20,74,455
TOTAL	92,33,872	69,91,488

The table furnished by Royle for the trade in 1850 practically corre-

inter-provincial coasting traffic may reappear as exports to foreign countries or figure in the road, river, and rail traffic to interior parts of the country. While, therefore, the estimate of 223 lakhs must include duplex if not multiplex returns (e.g., Bengal imports from Malabar figuring again as

1883-84 cocoa-nuts to the number of close upon two millions, valued at Rs. 9,000. In a like manner Bombay imports cocoa-nut products from Madras, Ceylon, Zanzibar, &c., and distributes doubtless a large pro-

conveyed to the port of shipment by internal means of transport India is itself perhaps the largest consuming country in the world for cocoa-nut products, so that, recollecting this fact, a conception of the total trade may be had by adding to the sea borne traffic an allowance for local production. Even when this has been done, a very imperfect idea will have been obtained of the value of the tree to the people of India. The mere returns of trade cannot give a just conception of the importance of a product which, like the cocoa-nut, to a large population, may be said to be their source of wealth as well as their food, drink, and occupation.

TRADE IN COIR, MANUFACTURED AND UNMANUFACTURED.

In all the returns of this subject care is taken to explain that these do not include ropes—coir ropes and cords being placed under a general heading with all vegetable cords.

1. The exports of RAW COIR are, however, so insignificant that a false impression is likely to be conveyed. The so-called manufactured coir, which figures extensively in the returns, appears to be largely crude

COCOS
nucifera

The Cocoa-nut Palm.

TRADE.

coir yarn which is dressed and employed by the European manufacturers, but of course a considerable trade is also done in mats, rugs, carpets, and other such manufactures. Glancing at the figures of the foreign trade in Coir (unmanufactured), the trade would seem to have practically remained stationary for many years past, and to be too small to justify the conclusion that India participates anything like to the extent it might in meeting the home market. The exports have averaged from 10,000 to 15,000 cwt for the past twenty years they were last year 12,347 cwt, valued at Rs 77,391, but in 1893 & 4, they reached to 20,098 cwt, valued at Rs 1,59,683. The foreign imports of coir are from Natal and Ceylon, and the bulk of these go to Bengal. The coir trade last year conveyed from one Indian port to another the following quantities of unmanufactured coir. Imports 18,052 cwt and exports 17,733 cwt. Of this trade, Madras exported 15,586 cwt. and imported only 309 cwt, Bombay exported 2,146 cwt and imported 8,336 cwt, while Bengal exported only 1 cwt but imported 8,335 cwt. The bulk of the Bombay and Bengal supplies came from Madras (viz, 5,756 cwt and 7,645 cwt respectively). Of the exports to foreign countries the United Kingdom received 10,215 cwt of last year's production, and of that amount 8,940 cwt were consigned from Madras.

II Of MANUFACTURED Coir (excluding ropes) India imported last year (18,709 cwt) valued at Rs 1,50,701 and exported 208,622 cwt, worth Rs 14,448. Of the imports, Ceylon sent 17,657 cwt, of which Bengal received 11,956, valued at Rs 1,22,552. Of the exports, Madras sent to foreign countries 168,678 cwt, valued at Rs 69,774, Bombay and Bengal each sending about 20,000 cwt. Of these exports the United Kingdom received 186,395 cwt, valued at Rs 17,32,815, and next in importance followed France, 9,836 cwt, the United States, 2,621 cwt, Australia, 2,485 cwt, and Arabia, 2,545 cwt, &c.

Of the coir trade in manufactured coir the imports and exports from one province to another were—imports 150,396 cwt, valued at Rs 11,16,957, and the exports 131,663 cwt, valued at Rs 3,36,427. Of these, Bengal received 60,500 cwt, Bombay 74,561 cwt, Sind 1,776 cwt, Madras 13,441 cwt. The Bengal and Bombay imports came mainly from Madras and Travancore, Cochin ranking next. The importance of Travancore as a seat of the coir manufacturing industry may be demonstrated by its imports into Bengal and Bombay; Madras sent 30,185 cwt, valued at Rs 2,61,199, and Travancore 27,613 cwt, valued at Rs 2,86,277, to Bombay, Madras sent 50,264 cwt, valued at Rs 2,72,567, and Travancore 17,327 cwt, valued at Rs 1,40,260. At the same time Madras last year sent a large amount to Travancore, viz, 14,283 cwt, valued at Rs 1,36,810. Of the total exports in the coir trade (viz, 131,663 cwt) Madras sent to other ports 112,642 cwt, and Bombay, next in importance, exported only 21,647 cwt. Of the total coir trade in imports (viz 150,396 cwt) Bombay generally heads the list, it received last year 74,561 cwt, while Bengal took 60,500 cwt, being followed by Madras with 13,441 cwt. Sind and Burma are unimportant, the former received only 1,776 cwt. Thus it will be seen that both in foreign and internal trade the coir industry is mainly concentrated in the Madras Presidency.

COIR ROPES.
1569

Coir Ropes.

Nothing can be learned as to the extent of the foreign and internal trade in coir ropes and cords, since the trade returns for these are published jointly with those of all other ropes. It has been said, however, that coir string is universally employed by the natives of India in the construction of their bamboo huts. For this purpose alone the consump-

The Cocoa-nut Palm: Coir Rope.

COCOS
nucifera.

tion must be enormous. The merits of coir as a rope fibre are now fully

COIR ROPES.

9 or to million pounds are annually shipped from India. Much of it is prepared in Ceylon, but Cochin is noted as the port of shipment for the best quality of yarn, and many thousand cut are annually exported

experiments, coir cordage broke at 224lb. Though not superlatively it exhibits of withstand- or cordage purposes, to less extensively imported arlon & Co., of Calcutta, placed in the Colonial and Indian Exhibition a trophy of ropes of which a striking feature was the arches of hawsers, 12 inches in diameter, thrown across the path; some of these were made of coir.

OIL.

OIL.
1570

The sliced kernel, dried at ordinary temperatures, either in the sun or artificially, contains from 30 to 50 per cent. of oil. The method of extracting this oil in India, especially when it is required to be colourless, is as follows: The kernel is boiled with water for a time, then grated and squeezed in a press. The emulsion thus obtained is next boiled until the oil is found to rise to the surface. The ordinary commercial oil is expressed by rude oil-mills worked by oxen.

The oil is white and nearly as fluid and limpid as water in tropical climates. It has a sweet and, according to some tastes an agreeable odour when fresh, but is liable to become rancid in a short time.

In Europe the oil is chiefly used in the manufacture of candles and soap. In India it is employed in cooking, and as medicine when fresh, and for burning, painting, soap-making, and anointing the body when rancid.

Regions where Oil is Produced.—While in the above sentences a brief abstract has been given of coco-nut oil, it is necessary to deal with this subject in greater detail. Enquiries are frequently addressed to the Government of India by merchants interested in the trade in this substance, so that it has become necessary to put on record as complete an account as can be collected from the scattered publications that exist, even though that prove but a statement of the paltriness of our knowledge. One of the earliest and to this day the most satisfactory descriptions of the Indian cocoa nut oil industry is that written by Lieutenant H. P. Hawkes and published in 1857. Gunstetter writers have contented themselves with

The Cocoa-nut Palm: Its Oil.

COCOS
nucifera.

chief seat of the trade. Certain writers familiar only with Bengal (with

Oil

has been offered in an early paragraph,—viz., to call in the aid of the
Maldivæ and Nicobar Islands,—will do well to concentrate his attention

method of making the oil is by dividing the kernels into two equal parts,

or split

1571

Under

to dry

them, after which they are exposed to the sun on mats, and when thoroughly

dried are subjected to pressure in an oil-press." Balfour remarks: "The

purest oil is obtained by gathering the kernel and depositing it in some

hollow vessel, to expose it to the heat of the sun during the day, and the

oil drains away through the hollow spaces left for the purpose." Hawkes

states that "the oil is generally prepared from the dried kernel of the

1572

1573

Khabrel,

1574

But a hot wet process is also adopted by which an oil is obtained which

seems to possess different properties from that prepared by cold expres-

sion. The *Thiëna Gazetteer* describes two such oils: "To make *avel* the

Avel

1575

fresh kernel is scraped on an iron blade set in a wooden footstool. The

scrapings are then put in a copper vessel over a slow fire, and after boil-

ing are squeezed, sometimes instead of boiling them the scrapings are

rubbed on a stone with a stone roller, and from time to time a little water

is thrown over them. The scrapings are then squeezed and the juice

boiled in a copper vessel, when the oil rises to the surface and is skimmed

off. To make *muthel* dried kernels are cut into thick pieces and boiled

Muthel

1576

in water. The pieces are then crushed in water and the whole is again

boiled over a slow fire, when the oil rises to the surface and is skimmed

off." It is worthy of careful observation that practically the difference

between *avel* and *muthel* oil is, that the former is made from fresh kernel

instead of from copra. Dr. Shortt says: "Boiled oil is obtained by

bruising the kopra or the fresh cocoa-nut, mixing it with an equal quantity

of water, and then boiling the mixture. As the water evaporates the oil

rises to the surface. It is poured off, and the *dbris* of the kernel is com-

1577

pressed by handfuls, so that any oil that remains may be extracted. Two

quarts of oil are produced, on an average, from 15 to 20 nuts." In

Borneo an oil expressed from the fresh cocoa-nut is used as a hair-oil,

1578

1579

C. 1579

COCOS
nucifera.

The Cocoa-nut Palm: Its Oil.

OIL.

treating the subject as too well known to call for any detailed description, and at most only the meagrest accounts have been given. To the merchant desirous of starting a new or extending an existing trade, the question of primary importance is not the district with which he should deal, but the coco-nut are coir-fibre, oil and spirits may be prepared extracted from the tree, that

and Travancore enormous quantities of oil are

of the products of the palm. It is not clear whether any two of these primary products or all of them, can be derived from the same trees or even prepared by the same cultivators—certain plants or portions of the plantation being periodically set apart for these several industries. Under coir fibre it has been said that the green or unripe coco-nut is alone used for that purpose, while most writers seem to agree that the ripe kernel is necessary for the oil. It would be most instructive to know if cultivation had resulted in the production of certain races of cocoa nuts famous for their oil-yielding properties, just as the inhabitants of the Laccadive Islands appear to have developed a small-fruited one with a specially good fibre. In connection with commercial reports on cocoa nut oil it is generally stated that the finest qualities are obtained from "Cochin" (Spon places Cochin after Ceylon). It

is also stated that this same statement occurs regarding the fibre of the Native State. The writer has been told that the oil industry, and is almost entirely derived from the Madras Presidency. If ripe cocoanuts are essentially necessary for the preparation of the oil, then the Maldive and Nicobar Islands might be looked to as the sources of supply for these islands export perhaps

and
an
Dutch
reeds
the
local grown nuts of Madras were
the very considerable imports from the Laccadive Islands. It is

large of at present, or that a small quantity of certain nuts are only are always or period a year. It may, of course, be the case that the trees are, to speak, pruned by the removal of a great number of green nuts from each tree, the remainder being used to ripen for oil purposes or as articles of diet.

It is to be feared, from want of data, information may be accepted as to the yield of the nuts. It is reported that, as a rule, the yield of the nuts is not

The Cocoa-nut Palm: Its Oil.

COCOS
nucifera.

chief seat of the trade. Certain writers familiar only with Bengal (with

oil

has been offered in an early paragraph, ^{viz}, to call in the aid of the Maldivé and Nicobar Islands,—will do well to concentrate his attention on the Madras Presidency.

Mode of Preparation of the Oil.—The ripe kernel is cut out of the shell in various ways, and either dried by exposure to the sun or by artificial

Malabar
al parts,
or split
Under

1571

oil drains away through the hollow spaces left for the purpose. Hawkes states that "the oil is generally prepared from the dried kernel of the nut, by expression in the ordinary native mills." The *Gazetteer of Thana* mentions three processes of making the oil. The first, giving origin to the

1572

1573

Khobrel.
1574

which are crushed in the oil-mill."

But a hot wet process is also adopted by which an oil is obtained which seems to possess different properties from that prepared by cold expression. The *Thana Gazetteer* describes two such oils: "To make *avel* the fresh kernel is scraped on an iron blade set in a wooden footstool. The scrapings are then put in a copper vessel over a slow fire, and after boiling are squeezed; sometimes instead of boiling them the scrapings are rubbed on a stone with a stone roller, and from time to time a little water is thrown over them. The scrapings are then squeezed and the juice boiled in a copper vessel, when the oil rises to the surface and is skimmed off. To make *muthel* dried kernels are cut into thick pieces and boiled in water. The pieces are then crushed in water and the whole is again boiled over a slow fire, when the oil rises to the surface and is skimmed off." It is worthy of careful observation that practically the difference between *avel* and *muthel* oil is, that the former is made from fresh kernel instead of from copra. Dr. Shortt says: "Boiled oil is obtained by

Avel
1575

Muthel
1576

quarts of oil are produced, on an average, from 15 to 20 nuts." In Borneo an oil expressed from the fresh cocoa-nut is used as a hair-oil, and is supposed, for that purpose, to be superior to oil obtained from copra. Hawkes says of the hot expression oil: "When required for edible purposes, the kernel of the fresh nut is taken, rasped and mixed with a little boiling water. This yields by pressure a milky fluid

quantity
the oil
s com-
Two

1577

1578

1579

C. 1579

COCOS
nucifera.

The Cocoa-nut Palm: Its Oil.

OIL.

treating the subject as too well known to call for any detailed description, only the meagrest accounts have been given. To the extending an existing trade, the

and spirits may be the tree, if on, bre use

whether any two of these plants, from the same trees or even prepared by the same plants or portions of the plantation being periodically set apart for these several industries. Under coir fibre it has been said that the green or unripe cocoa-nut is alone used for that purpose, while most writers seem to agree that the ripe kernel is necessary for the oil. It would be most instructive to know if cultivation had resulted in the production of certain races of cocoa-nuts famous for their oil-yielding properties, just as the inhabitants of the Laccadive Islands appear to have developed a small-fruited one with a specially good fibre. In connection with commercial reports on cocoa-nut oil it is generally stated that the finest qualities are obtained from "Cochin" (Spon places Cochin after Ceylon). It will be recollected that this same statement occurs regarding the fibre derived (or supposed to be derived) from that Native State. The writer has failed to find any account of the Cochin oil industry, and is almost forced to conclude that the Cochin cocoa-nut oil, as with "Cochin

the Madras islands export perhaps its a year, they do not appear to be of use for fibre, looked to as a source of oil for the inhabitants growing a few to the Malabar either as imports from the Maldives and important as compared with those not Bengal, appears to control lead to the inference that the employed for the expression of the locally grown nuts of Malabar oil—the very considerable imports from the Laccadives affecting mainly the oil—the very considerable imports from the Laccadives affecting mainly the

those of certain islands only are yielding. It may, of course, be the case that the trees are pruned by the removal for coir of so many green nuts from each tree, the remainder being allowed to ripen for oil purposes or as articles of diet.

This brief review, from want of definite information, may be accepted as indicating the direction that future reports might assume; but it may safely be concluded that, as with coir, so with coconut oil, Malabar is the

The Cocoa-nut Palm : Its Oil.

COCOS
nucifera.

OIL.

practically no cocoa-nut oil, so that her exports to foreign countries and to other Indian ports were drawn exclusively from local supplies. With the

155,202 gallons to Bengal. But Bengal exported coastwise 8,040 gallons and Bombay 3,454. The Bengal exports went to Burma and the Bombay to Sind, Madras, Goa, Kattywar, &c. Adding the foreign exports to the coastwise exports and deducting the total of the imports, we learn that

Madras exports which may Bengal and in the imports exceed the exports, in the former by 313,009 gallons and in the latter by 1,125,572 gallons. By these amounts the local production did not equal the consumption plus the internal trade from these presidencies. Cocoa-nut oil is thus a speciality of Madras trade.

COPRA OR DRIED KERNEL.

COPRA.
1587

A very imperfect idea of the supply and demand for this oil would, however, be conveyed were we to omit to examine in this place the trade in copra or dried kernel, the substance from which the oil is expressed. This is largely exported to foreign countries and sent from one province of India to another to be locally made into oil.

	1884-85.		1885-86.		1886-87.	
	Cwt.	₹	Cwt.	₹	Cwt.	₹
Imports	39,653	3,95,685	105,296	10,20,841	125,222	11,76,799
Exports	64,323	5,34,291	21,755	1,86,800	9,337	79,836

The imports come chiefly from Ceylon and the Straits Settlements, and are almost exclusively delivered in Bengal and Bombay, only very small amounts being received by Madras. The exports, on the other hand, go

347,255 cwt., valued at ₹35,31,115, and the exports 236,250 cwt., valued at ₹23,00,958. Of the imports, Bombay received 219,204 cwt., Bengal 62,971 cwt., Sind 34,658, Madras 27,025 cwt. Of the exports, Madras sent to other Indian ports 182,509 cwt. Bombay 53,295 cwt., Bengal exporting

OIL CAKE.
1588

inland. It is also largely used to fatten fowls, pigs, cows, and other

C. 1588

COCOS
nucifera.

The Cocoa-nut Palm: Its Oil.

OIL.

Further on he adds that the "Cochin is usually 20s. per ton more than the Ceylon or Coromandel coast article" Dr. Symock, in his last edition of the *Vegetable Materia Medica of India*, says: "The value of cocoa-nut oil in Bombay ranges from Rs 6 to 20 per cwt."

The *Gazetteer of Kolhapur District* states that 45 lb of dried copra yield 26 $\frac{1}{2}$ lb of oil and 18 $\frac{1}{2}$ lb of oil-cake. This would be about 52 $\frac{1}{2}$ per cent. of oil. Another writer puts the yield down at 36 per cent. There are so many different modes of preparing the oil that, apart from the possibility of there being superior and inferior oil-yielding forms of the plant, it must necessarily be difficult to fix definitely what may be regarded as the yield. It may, however, be accepted as somewhere between 30 to 50 per cent. Hawkes states that each tree is calculated to yield at least 2 $\frac{1}{2}$ gallons of oil per annum, and the coir obtained from the nuts is estimated to yield one fourth of the value of the oil, whilst the oil-cake is very valuable for cattle as a manure." It will be observed the idea seems to be conveyed in the above passage that the coir from the ripe or copra-yielding nut is of value. No other writer appears to support this opinion.

Royce says that 2 quarts of oil may be expressed from 14 to 15 cocoanuts. *Spang's Encyclopædia* states that in the ordinary country oil-mill 180 lb of copra will yield 40 quarts of oil, and that about 40 nuts are required to yield a gallon of oil. The trees grown on salt marshes are stated to yield much less oil than those grown on mixed sandy and loamy soils.

1586

TRADE IN COCOA-NUT OIL.

Royce remarks that the imports into Great Britain of cocoa-nut oil were in 1850, 98,039 cwt., of which India furnished 85,096 cwt. Hawkes states: "The average annual quantity exported from the Madras Presidency from 1830-51 to 1854-55 is about 1,410,953 gallons. Of this by far the largest proportion is sent to the United Kingdom and France, the remainder finding its way to Arabia, Mauritius, Bombay, and the French (Indian) ports." In 1850, as in the present day, the cocoa-nut oil trade almost entirely centred in Madras, so that the above passages may be taken as approximately indicating the extent of the foreign demand for the oil forty years ago. In 1880-81 the foreign exports amounted to 1,888,122 gallons valued at Rs 20,90,797, Madras alone having shipped to foreign countries 1,690,520 gallons, and sent in addition by coasting trade to other Indian ports 1,493,756 gallons. In 1886-87 the exports were 1,000,864 gallons valued at Rs 13,24,589, and the imports 556,562 gallons valued at Rs 7,54,515. The bulk of the exports (*viz.*, 689,087 gallons) went to the United Kingdom, Madras alone shipping 1,090,480 gallons of the total exports. The imports were mainly from Ceylon (438,144 gallons), Bengal taking by far the largest proportion of these imports (*viz.*, 350,437 gallons). If to these facts an abstract of the coasting traffic be added, some idea of the present position of the cocoa-nut oil trade may be had. The imports coastwise were last year 1,567,486 gallons valued at Rs 20,60,067; the exports were 1,942,809 valued at Rs 20,74,455. These were the amounts of the oil that went to and from the various ports of India; but the full meaning of these figures will be brought out by giving some of the particulars of this exchange. Of the imports, Bombay received 794,577, Burma 338,056, Bengal 131,463 gallons, and these quantities were almost entirely obtained from Madras. Cochin sent to Bombay 15,789 gallons and to Madras 13,188 gallons. The other items to make up the total coastwise imports were unimportant. Local production added to these imports would constitute the supply from which the exports could be made, and in the case of Madras it is noteworthy that that presidency imported

The Cocoa-nut Palm as a Medicine.

COCOS
nucifera.

MEDICINE

Shell-Oil.
1599

nel of the nut. These are known as *khobrel*, *avel*, and *muthel*. A fourth oil is, however, repeatedly alluded to, namely, an oil prepared from the shell of the nut (*see above*). This last-mentioned oil is perfectly distinct from the oil of the kernel and is used only in the treatment of ringworm. Its

to the shell by the inhabitants of other parts of the world besides India, although they do not apparently distil the oil from it. But of the kernel oils used medicinally, the most conflicting statements have been published both as to their action and mode of preparation. Thus, "A very cheap, hard, white soap is prepared from the oil, suitable for pharmaceutical purposes, such as plaster-making and the preparation of soap liniment" (*Dymock*). The *Pharmacopæia*, on the other hand, says this oil is inferior to ground-nut oil and sesamum oil as a vehicle for liniments. Sakharam Arjun remarks: "The fresh oil is prepared for medicinal purposes by boiling the milk of the ripe cocoa nut. It is used

1600

properties of the oil are discussed in the *United States Dispensatory*. In Germany it has been used in pharmacy, to a considerable extent, as a substitute for lard, to which, according to Pelten Kofer, it is preferable on account of its less tendency to rancidity, its more ready absorption when rubbed on the surface of the body, and its less liability to produce chemical changes in the substance with which it is associated. Thus the

ointment
a few
two mc
prepare
water,
externa

1601

part of cocoa-nut oil, prepared in London, and, under the name of *coco-oleum*, used, instead of the oil itself, as a substitute for cod-liver oil. The

ly different properties. This fact might almost be supposed to be in consequence of chemically different oils being isolated. Dr Dymock says of the so-called *muthel* oil: "In the Konkan the oil which separates from the freshly-rasped kernel, alone or mixed with tamarind-seed oil, is used under the name of *muthel* as an application to burns and rheumatic swell-

1602

After a
"To
water
over a

much used as a local
fevers and debilitating
vermifuge in Jamaica.
sugar, in flux. An emulsion of the oil and kernel is prescribed in coughs

e it is
f hair after
ra and as a
with a little

C. 1602

COCOS
nucifera.

The Cocoa-nut Palm as a Medicine.

animals It is sometimes exported to Europe In Madras it sells for 3 to 4 mounds (of 25lb) per rupee

MEDICINE.

The GREEN FRUIT is given as a refrigerant, the FLOWERS as an astringent, and the OIL employed as a substitute for cod-liver oil The milk of the nut, the juice from the FLOWERING BRISTLE, and the tomentum from the LEAVES are all used medicinally

WATER OR MILK FROM THE GREEN NUT—"The WATER (or milk) of the unripe fruit is described as a fine-flavoured, cooling, refrigerant drink, useful in " " and urinary disorders" (U C Dutt) It may be drunk to " " and is considered by the native doctors It is commonly believed in Bengal, h. induces a hydrocele swelling of the

however, that too much of the scrotum.

THE EDDLE PULP AND THE MILK PREPARED THEREFROM—The pulp of the young fruit is nourishing, cooling, and diuretic The pulp of the ripe fruit is hard and indigestible but is used for medicinal purposes Ainslie says "By scraping down the ripe kernel of the cocoa nut and adding a little water to it, a white fluid is obtained by pressure, which very much resembles the milk in taste and may be used as a substitute for it" "Dr Shortt reports having successfully employed the fresh milk—the, the EXPRESSED JUICE of the grated kernel—in debility, incipient phthisis, and cachectic affections, in doses of from 4 to 8 ounces twice or thrice daily and its taste, and may be used as an excellent substitute for cow's " " in some cases actively purgative, hence it is suggested " " as a substitute for castor oil and other nauseous purgatives" (Pharm. Ind., 247)

The following is a prescription known in Hindu medicine as *Narikela khanda* "Take of the pounded pulp of cocoa nut half a seer, fry it in 8 *toils* of clarified butter, and afterwards boil in 4 seers of cocoa nut water till reduced to a syrupy consistence. Now add coriander long pepper, bamboo manna, cumin seeds, nigella seeds, cardamoms, cinnamon *tesa patra*, the tubers of *Cyperus rotundus* (*mustak*) and the flowers of *Mesua ferrea* (*naga kesara*) 1 *tola*, each in fine powder, and prepare a confection, Dose 2 to 4 *toils* in dyspepsia and consumption" (U C Dutt, *Hind Med. Med.*, 248)

THE SHELL—"The cleaved SHELL of the nut or portions of it are burnt in a fire, and while red hot, covered by a stone cup The fluid which is deposited in the interior of the cup is rubefacient, and is an effectual domestic remedy for ringworm" (U C Dutt, p. 248) The *Bombay Gazetteer of the Thana District* alludes to this in the following words "The shell when burnt yields an oil which is used as a cure for ringworm" "In the Antilles, the cocoa nut is the popular remedy for tapeworm, and its efficacy has been conclusively demonstrated by medical men in Senegal A cocoa nut is opened and the almond extracted and scraped Three hours after its administration a dose of castor oil is given The worm is expelled in two hours afterwards In nine cases in which this remedy was tried by a surgeon in Senegal the result was complete—*Natal Mercury*" (*Trop. Agri.*, 1882-83)

THE OIL—A reference to the account given of the ordinary oil in another page will reveal the fact that there are three or four oils obtained from the cocoa-nut, or rather three or four methods of preparing oil from it which seem to give to the substance different properties In the Thana district, for example, three oils are prepared from the edible portion or ker-

The Cocoa-nut Palm as a Medicine.

COCOS
nucifera.

THE FLOWERS.—Are sometimes used medicinally, being said to be astringent.

MEDICINE.
Flowers.

1607

Nuts.

1608

Roots.

1609

Ashes.

1601

Bud.

1611

eases" (*U. C. Dutt, 248*) It is also employed as an astringent gargle in sore-throat.

THE ASHES.—"The ASHES of the leaves contain an amount of potash; they are used medicinally."

THE BUD—The tender buds of this palm, as also of *Borassus* and *Phoenix*, are esteemed as a nourishing, strengthening, and agreeable vegetable.

Special Opinions.—§ "The husk of the fruit of the *Cocos nucifera* is used in the treatment of male fern when taken."

IV Nolan, M.D., Bomba

acidity and gastric irritation as a local application

B A, M.B., Monghyr.

eczema of the scrotum,

ing is a popular domestic remedy, 1st Madras Cavalry, Bangalore).

well, and is used in such and other

R. Thomson, M.D., C I E, Madras

THE COCOA-NUT MILK of the green fruit is a cooling, refrigerant drink, containing albumen and salines. It is a good drink in cholera cases.

It succeeds in checking vomiting when other means fail. Cocoa-nut oil, prepared from fresh pulp, is a good substitute for cod-liver oil. The dose given is from 20 to 30

daily. An ash is prepared

is a valuable anti-acid

sweet extract is also

(*Civil Surgeon R. L. D*

from this palm is very refreshing and possesses laxative properties. Its continued use (twice or thrice weekly) during pregnancy has a marked effect on the colour of the infant, which is born of a fair complexion,

of the skin. It improves the general health like cod-liver oil" (*Assistant Surgeon Shub Chunder Bhattachary, in Civil Medical charge, Chanda, Central Provinces*) "The

and soothing" (*C*

nut (*Narikel khon*

of chronic heartb

Anund Chunder Mukerji, Noakhalli) "The oil is extensively used to fatten and is given for children" (*Lyonel Beech, Cocacry much used here*)

(*Civil Sur*

growth of

oil is considered to increase the growth of hair and render it black (*A Civil Surgeon*) "If the flowers are mixed with sugar, the root of *khus-khus*, and white *chandam*, with a little water, the combination will be found good in bilious fever, will check vomiting, and produce a cooling

COCOS
nucifera.

The Cocoa-nut Palm as a Medicine.

MEDICINE.

and pulmonary diseases generally. Pound the kernel with water, place it in a strainer, and skim off the cream. It is preferable to the expressed oil."

1603

"Cocoa-nut oil was proposed by the late Dr. Theophilus Thompson (*Proc. ed. of Royal Society, 1832, pt. III, p. 41*) as a substitute for cod-liver oil; and in this character it has been favourably noticed by Dr. J. H. Warren (*Edin Med and Surg. Journ., Vol. III, p. 377*) and others. The substance used in these cases was not the ordinary commercial oil, but the oil obtained by pressure from the crude oil (in the solid state it is met with in England), refined by being treated with alkalis, and then repeatedly washed with distilled water. In his Lethæmian Lectures Dr. Thompson gives the result of his treatment with this agent in 53 cases of phthisis. Of the first 30, 19 were much benefited, in 5 the disease remained stationary, and in the remaining 6 the disease continued to advance. Of the second 23, 15 were materially benefited, 3 remaining stationary, and 5 became worse. Dr. Garrod (*Brit and For Med Chir Rev., Jan 1856*) has shown that it exercises a marked influence, almost equal to cod liver oil, in increasing the weight of the body. The great advantage of its employment experienced by Dr. Thompson, Dr. Garrod, and also by the Editor, who instituted some trials with it, is, that under its prolonged use it is apt to induce disturbance of the digestive organs and diarrhoea. Its use is favourably noticed in the Report of Drs. Van Someren and Oswald, and Mr J. Wood' (*Pharmacopœia of India*).

Dr. Dymock says cocoa-nut oil has been tried in Europe as a substitute for cod liver oil, "but its indigestibility is a great drawback to its general use." Drury observes "its prolonged use, however, is attended with disadvantage, inasmuch as it is apt to disturb the digestive organs and induce diarrhoea." May it not be that the unfavourable opinions formed by some writers regarding this medicinal oil proceed from the fact that nearly every author describes a different mode of preparing it and consequently that it is possible many different substances or a substance in many stages of purity or impurity may have been experimented with? In the Maldives cocoa nut oil is esteemed a powerful antidote against the bite of poisonous reptiles.

Juleo.
1604

THE JUICE.—The freshly-drawn juice is considered refrigerant and diuretic, and is valuable as a preparation known as toddy poultice (see also under *Borassus*, B 677). The fermented juice constitutes one of the spirituous liquors described by the ancient writers. "A tumblerful of the fresh juice is sometimes taken early in the morning on account of its refrigerant and slightly aperient properties." (*Dymock*).

Husk.
1605

SCRAPINGS OF THE HUSK.—"The outside scrapings of the husk and branches applied to ulcers will cleanse and heal them rapidly if soaked in proof rum, the efficacy of this application was proved by the case of two bad ulcers occasioned by the bite of a negro's teeth. The young roots boiled with ginger and salt are efficacious in fevers, the same as the bamboo" (*Royle*).

Tomentum
1606

THE COTTON OR TOMENTUM.—"This is a soft, downy, light-brown-coloured substance, found on the outside of the lower part of the branches of the cocoa-nut tree where they spring from the stem, and are partially covered with what is called *panaday*, or coarse vegetable matting of the tree. The COCOA-NUT COTTON is used by the Indians for stopping blood, in cases of wounds, bruises, leech-bites, &c., for which purposes it is admirably fitted by its peculiar texture" (*Ainslie, Mat Ind*). (Compare with tomentum of *Caryota urens* and of *Borassus*, B. 680. See also under *Tinder*.)

C. 1606

The Cocoa-nut Palm: Its Edible Products.

COCOS
nucifera.TRADE
IN NUTS

1,434,821, and East Africa 627,346. Of these imports Bengal took 8,430,229, valued at R1,75,552, Burma 5,618,949, valued at R3,72,702, Bombay and Madras each received 700,000, and Sind 86,800. Bengal

Maldives being viewed as foreign territory (while the Laccadives and It is noted meeting the kson's paper of the British nuts are eaten or made into confectionery, he continues. "Cocoa-nuts are largely used

and bakers, though the Ceylon run them close.

Indian—The coastwise trade or interprovincial exchange is, however, very important. The total imports from one port to another were last year

Of the coastwise exports in 1886-87 Bengal sent to Burma, according to another an ports, Madras, Bombay, o Burma, and 2,591,475 to Cutch. Burma exports no cocoa-nuts, but it seems probable that some of its imports, which appear as from Bengal, may be from the Nicobar Islands. These islands being associated in trade returns with Bengal, direct exports may occasionally not appear as exports from Bengal, hence, in all probability, the disparity in the figures of imports into Burma alluded to above.

JUICE FROM THE COCOA-NUT

Dr. Hugh Cleghorn has described as follows the process of tapping the palm for its juice in Madras—a process which is essentially that followed in Bombay and other parts of the country; this palm is not tapped in Bengal. When the spathe is a month old, the flower-bud is considered sufficiently juicy to yield a fair return to the (*Sanar*) toddy-drawer, who ascends the tree with surprising ease and apparent security, furnished with the apparatus of his vocation. A year's practice is requisite before the *Sanar* becomes an expert climber. The spathe when ready for tapping is 2 feet long and 3 inches thick. It is tightly bound with strips of young leaves to prevent expansion, and the point is cut off transversely to the extent of one inch. He gently hammers the cut end of the spathe to crush the flowers thereby exposed and to determine the sap to the wounded part, that the juice may flow freely. The stump is then bound up with a broad strip of fibre. The process

JUICE.
Madras.
1620

COCOS
nucifera.

The Cocoa-nut Palm: Toddy.

JUICE

Is repeated morning and evening for a number of days, a thin layer being shaved off on each occasion, and the spathe at the same time trained to bend downwards. The time required for this initiatory process varies from five to fifteen days in different places. The time when the spathe is ready to yield toddy is correctly ascertained by the chattering of birds, the crowding of insects, the dropping of juice, and other signs unmistakable to the Sínár. The end of the spathe is then fixed into an earthen vessel called *kudare*, and a slip of leaf is pricked into the flower to catch the oozing liquor and convey the drops clear into the vessel. When the juice begins to flow the hammering is discontinued. A single spathe will continue to yield toddy for about a month, during which time the Sínár mounts the tree twice a day and empties the juice into his *eropetty* (a vessel made of closely-plaited palmyra fibre), and repeats the process mentioned above of binding and cutting the spathe an inch lower down, and inserting its extremity into the *kudare*. The flow is less during the heat of the day than at night. One man will thus attend to 30 or 40 trees. Forty trees will yield about 12 Madras measures ($1\frac{1}{2}$ to 2 gallons) of juice—7 measures in the morning and 5 in the evening. This is at the rate of about a quarter of a measure per tree. The length of time a tree will continue to yield varies from six months to a year in very favourable soil. But it is not considered prudent to draw all the juice one can from a tree, as it will then become barren all the sooner. Dr Shortt says the quantity of sap a tree will yield varies according to locality and the age of the spathe; 3 to 4 quarts is the average quantity obtained in 24 hours for a fortnight or three weeks. "Sometimes this fluid is converted into what is termed *nira* by lime-washing the vessels that collect the fluid in order to neutralise the acidity. It is then sold as a sweet and refreshing drink in the bazaars." "Toddy," he proceeds to say, "is also boiled down into a coarse kind of sugar called *jaggery*, which is converted into molasses for the manufacture of spirits, or refined into white or brown sugar before fermentation sets in."

Bombay.
1621

In Bombay the cocoa-nut palm is tapped for its juice in Ratnágiri (*Gas*, X, 34), in Kolábra (*XI*, 38), in Khándesh (*XII*, 321), in Thána (*XIII*, Part I, 295), and in Kánara (*XV*, Part I, 58, Part II, 205). According to the returns the writer has had access to, there are some 3½ million trees in Bombay, of which about 30,000 to 40,000 are tapped for their juice.

The following abstract from the *Kolábra and Ratnágiri Gazetteers* may be accepted as fairly representing the process of tapping pursued in Bombay, the yield, rent paid, return and profit being there shown. The cocoa nut gardens are generally owned by Hindus, who let the trees to rich Bhandáris, who agree to supply the owner of the liquor shops with fermented or distilled juice. From the very earliest times cocoa-nut trees have been taxed, a distinction being made between trees kept for fruit and those set apart to be tapped. In the Ratnágiri district, it is stated, toddy trees let at from 2s to 6s (Rs 1 to Rs 1) a year. In addition to rent, a Government tax on trees tapped has to be paid. The maximum leviable rate was in Malabar and Deogad 2½d (1 anna 8 pie) a month or 2s 6d (Rs 1½) a year on each tree tapped. Under the new system a special license is granted to tap trees, at a fixed rate for each tree, and under certain conditions as to the number of trees included in the license. The licensees are allowed to sell toddy by retail at the foot of the trees, but not to distil, the latter privilege being vested exclusively in the licensed shop-keepers for the sale of country spirit. In Kolábra, it is said, the crude juice of fifteen trees costs the Bhandári about £1 2s (Rs 1) a month or 1s 6d (12 annas) per each tree. Besides the wages of the distiller and cost of fuel the Bhandári has to make good to the liquor-shop keeper part of the tap-

The Cocoa-nut Palm: Toddy.

COCOS
nucifera.

JUICE.

ping tax he had paid to Government. Government levies from the liquor-shop keepers £60 (R600) a year for every hundred trees tapped. Three fourths of this the liquor-shop keeper pays; the remaining fourth he recovers from the Bhandári who supplies the liquor. The Bhandári's share of the tax amounts to £15 (R150) on one hundred trees for one year,—that is, a monthly charge of £1.5s. (R12½) on the one hundred trees, or on each tree a monthly tax of 3d. (2 annas).

In Ratnágiri the yield is said to vary from 35 to 64 imperial gallons from each tree. In R.¹²¹—
 (1½ seers) of juice a d
 seldom sold raw; mos
 him to the liquor-shop accept. with the wages of an assistant the
 monthly charge for distilling the produce of one tree is about 2d. (1½
 annas). The cost of the spirit is about 1d. (½ anna) per gallon.

In Ratnágiri, in consideration, tapping, distilling, &c., the Bhandári pays about 2s. 5d. (R1-3-3) for the produce of each palm. Allow-
 ing for loss by estimating, instead of 5½, only 5 gallons, and he obtains
 3s. (R1-8) for the spirit prepared from each palm. This leaves him a net
 profit of 7d. (4½ annas) on each tree, and if he possesses a plantation of
 300 trees he makes a fairly good income.

Of Ratnágiri, it is said, there are ordinarily three kinds of palm spirit,
 known respectively as *rasi*, *phal* or *dharti*, and *phéni*; *rasi* being the
 as a still stronger spirit
 wholesale rates at which
 for the imperial gallon,
 1 pie), *phal* 1s. 1½d. (8
urán 4s. 9½d. (R2-6-4).

and spirits are distilled in private stills, licensed to be kept at certain
 Bhandáris' houses under fixed conditions as required, in proportion to
 the number of trees licensed to be tapped in the vicinity. One still is
 usually allowed for every 100 trees, and the still-pot is limited to a capa-
 city of 20 gallons.

Spirit

Rasi.
1622
Phal.
1623
Pheni.
1624

FERMENTED AND UNFERMENTED BEVERAGE.

TARI.
1625

This is one of the forms of the so-called palm-wine so much extolled by
 the early European visitors to India. From what has been said in the
 preceding pages regarding the juice it may have been inferred that, if left
 for a short time after removal from the tree, it rapidly ferments and becomes
 intoxicating. This is the *tari* or toddy (or in the case of the cocoa-nut
 more specifically known as the *nira*), a beverage very extensively con-
 sumed in India. Fermentation is said to be prevented by the addition
 of a little lime to the fluid. The earthen vessels into which it drains
 are generally powdered with lime when the fluid is to be drunk in its
 fresh unfermented state, or is intended to be boiled down to sugar or
 jaggery. It is also drawn early in the morning instead of being left
 on the tree overday. Robinson says of the Laccadive islanders that "they
 are still so strict in the abstinence from all fermented liquors, that the
 manufacture of toddy would not be tolerated in the islands." Self-
 fermented toddy is extensively used by the bakers in India in place of
 yeast. When fermented the juice may be distilled into spirits or made
 into vinegar. One hundred gallons of *tari* yields on an average twenty-
 five of *arak* by distillation.

COCOS
nucifera.

The Cocoa-nut Palm: Toddy.

JUICE.

is repeated morning and evening for a number of days, a thin layer being shaved off on each occasion, and the spathe at the same time trained to bend downwards. The time required for this initiatory process varies from five to fifteen days in different places. The time when the spathe is ready to yield toddy is correctly ascertained by the chattering of birds, the crowding of insects, the dropping of juice, and other signs unmistakable to the Sānār. The end of the spathe is then fixed into an earthen vessel called *kudare*, and a slip of leaf is pricked into the flower to catch the oozing liquor and convey the drops clear into the vessel. When the juice begins to flow the hammering is discontinued. A single spathe will continue to yield toddy for about a month, during which time the Sānār takes a day and empties the juice into his *propetty* (a fibre), and repeats the process men-

he spathe an inch lower down, and in-
serting its end. The flow is less during the heat of the day than at night. One man thus attend to 30 or 40 trees. Forty trees will yield about 12 Madras measures (1½ to 2 gallons) of juice—7 measures in the morning and 5 in the evening. This is at the rate of about a quarter of a measure per tree. The length of time a tree will continue to yield varies from six months to a year in very favourable soil. But it is not considered prudent to draw all the juice one can from a tree, as it will then become barren all the sooner. Dr. Shortt says the quantity of sap a tree will yield varies according to locality and the age of the spathe; 3 to 4 quarts is the average quantity obtained in 24 hours for a fortnight or three weeks. "Sometimes this fluid is converted into what is termed *nira* by lime-washing the vessels that collect the fluid in order to neutralise the acidity. It is then sold as a sweet and refreshing drink in the bazaars." "Toddy," he proceeds to say, "is also boiled down into a coarse kind of sugar called *jaggery*, which is converted into molasses for the manufacture of spirits, or refined into white or brown sugar before fermentation sets in."

Bombay.
1621

In Bombay the cocoa-nut palm is tapped for its juice in Ratnāgiri (*Gas*, X, 34), in Kolāba (*XI*, 28), in Khāndeshi (*XII*, 321), in Thāna (*XIII*, Part I., 295), and in Kānara (*XV*, Part I., 58, Part II., 205). According to the returns the writer has had access to, there are some 3½ million trees in Bombay, of which about 30,000 to 40,000 are tapped for their juice.

The following abstract from the *Kolāba and Ratnāgiri Gazetteers* may be accepted as fairly representing the process of tapping pursued in Bombay, the yield, rent paid, return and profit being there shown. The cocoa-nut gardens are generally owned by Hindus, who let the trees to rich Bhandāris, who agree to supply the owner of the liquor shops with fermented or distilled juice. From the very earliest times cocoa-nut trees have been taxed, a distinction being made between trees kept for fruit and those set apart to be tapped. In the Ratnāgiri district, it is stated, toddy trees let at from 25 to 65. (R1 to R3) a year. In addition to rent, a Government tax on trees tapped has to be paid. The maximum leviable rate was in Malabar and Deogad 2½d (1 anna 8 pie) a month or 25 6d (R1½) a year on each tree tapped. Under the new system a special license is granted to tap trees, at a fixed rate for each tree, and under certain conditions as to the number of trees included in the license. The licensees are allowed to sell toddy by retail at the foot of the trees, but not to distil, the latter privilege being vested exclusively in the licensed shop-keepers for the sale of country spirit. In Kolāba, it is said, the crude juice of fifteen trees costs the Bhandāri about £1-25. (R11) a month or 12 6d (12 annas) per each tree. Besides the wages of the distiller and cost of fuel the Bhandāri has to make good to the liquor-shop keeper part of the tap-

The Cocoa-nut Palm: Toddy.

COCOS
nucifera.

JUICE

ping tax he had paid to Government. Government levies from the liquor shop keepers £60 (R600) a year for every hundred trees tapped. Three fourths of this the liquor-shop keeper pays, the remaining fourth he recovers from the Bhandāri who supplies the liquor. The Bhandāri's ne hundred trees for one } on the one hundred trees,

In Ratnagiri the yield is said to vary from 35 to 64 imperial gallons from each tree. In Kolaba a tree is said to yield on an average 4½ pints (1½ seers) of juice a day, or 10½ imperial gallons a month. The juice is seldom sold raw: most of it is distilled by the Bhandāri and sold by him to the liquor-shop keeper. With the wages of an assistant the monthly charge for distilling the produce of one tree is about 2d (½

3s (R1-8) for the spirit prepared from each palm. This leaves him a net profit of 7d (4½ annas) on each tree, and if he possesses a plantation of 300 trees he makes a fairly good income.

Of Ratnagiri, it is said, there are ordinarily three kinds of palm spirit, known respectively as *rasi*, *phul* or *dharti*, and *pheni*; *rasi* being the weakest and *pheni* the strongest. In some places a still stronger spirit called *durasi* is manufactured. The average wholesale rates at which the farmers buy stock from the manufacturers are for the imperial gallon, *tadi* 2½d (1 anna 10 pie), *rasi* 8½d (5 annas 7 pie), *phul* 1s 1½d (8 annas 9 pie), *pheni* 2s 6½d. (R1-4 6) and *durasi* 4s 9½d (R2 6-4). The spirits are distilled in private stills, licensed to be kept at certain Bhandāris' houses under fixed conditions as required, in proportion to the number of trees licensed to be tapped in the vicinity. One still is usually allowed for every 100 trees, and the still pot is limited to a capacity of 20 gallons.

Spirit

Rasi,
1622
Phul
1623
Pheni
1624

FERMENTED AND UNFERMENTED BEVERAGES

TARI,
1625

This is one of the forms of beer. It is the early European preceding page for a short time intoxicating.

more specifically known as the *nira*) a beverage very extensively consumed in India. Fermentation is said to be prevented by the addition of a little lime to the fluid. The earthen vessels into which it drains are generally powdered with lime when the fluid is to be drunk in its fresh unfermented state, or is intended to be boiled down to sugar or *jaggery*. It is also drawn early in the morning instead of being left on the tree overday. Robinson says of the Laccadive islanders that they are still so strict in the abstinence from all fermented liquors, that the manufacture of toddy would not be tolerated in the islands'. Self-fermented toddy is extensively used by the bakers in India in place of yeast. When fermented the juice may be distilled into spirits or made into vinegar. One hundred gallons of *tari* yields on an average twenty-five of *arak* by distillation.

COCOS
nucifera.

The Cocoa-nut Palm: Sugar.

PALM SUGAR

PALM SUGAR

Instead of being fermented, the liquor may be evaporated down and its sugar thus extracted "Eight gallons of sweet toddy, boiled over a slow fire, yield 2 gallons of a lusciously-sweet liquid, which is called *jaggery* or sugar-water, which quantity being again boiled, the coarse brown sugar called *jaggery* is produced. The lumps of this are separately tied up in dried banana leaves" (Royle). Dr Shortt says: "The sap is poured into large pots over an oven, beneath which a strong wood-fire is kept burning, the dead fronds and other refuse of the plants being used as fuel. The sap soon assumes a dark brown semi-viscid mass, well known as *jaggery* or *gûr*, which whilst warm is poured into earthen pots or pans for preservation. Ten to twelve seers of the sap yield one of *jaggery*, the value of a maund of this *jaggery* is about 2 rupees. In this state it is sold to *abkari* contractors, sugar refiners, or merchants. The sugar refined comprises several sorts, known in the market as moist, raw, coarse, and fine sugar. The *jaggery* is placed in baskets and allowed to drain, the watery portion or molasses dropping into a pan placed below. This is repeated, so that the *jaggery* or sugar becomes comparatively white and free from molasses. This sugar—for so it may now be called—is put out to dry, and the lumps broken up, when dry it is termed raw sugar, and weighs about 25 per cent of the whole mass, the rest of it being collected in the form of molasses." Thus cocoa-nut sugar is chiefly met with in the form of *jaggery*. It is well known, however, that it is capable of being refined according to European principles, and a certain amount of cocoa nut sugar is regularly prepared. "The success of Dr J N Fonseca (author of the *History of Goa*) in converting toddy of the cocoa-nut tree into crystallized sugar, has been hailed with satisfaction by the press at Goa, and flattering calculations are made of the advantages that will accrue to the country from the development of this new industry" (*Bombay Gazette*). A similar sugar is prepared from the date-palm, from the palmyra-palm, and from the Indian sago-palm (*Caryota urens*). The date palm is very largely used for this purpose in Bengal, and the cocoa nut and palmyra palms in Madras, while in Bombay, apparently, sugar is only very occasionally made from the juices of these trees, but when extracted it is most generally prepared from the palmyra or *Caryota* palms. Some years ago the Government of Bombay, getting alarmed at the growth of the habit of toddy-drinking, brought Jessore sugar manufacturers to try the experiment of preparing sugar from the date-palms of the western presidency. According to the returns of the Surat district there are in that district alone 1,195,901 date-palm trees, of which 489,395 were tapped in 1867-68. But it was found that the returns from sugar manufacture were so poor, as compared to the profits from the sale of *tari*, that the experiment practically failed. It is not known whether or not sugar to any appreciable extent is actually prepared from the Bombay palms, nor even whether a license is necessary to tap trees for sap intended to be so used. Of the Thána district it is said "Coarse sugar or *gûr* is also made by boiling the juice in an earthen pot over a slow fire." It is worth recording that, according to the *Gazetteers*, there are 3,500,000 cocoa-nut trees in Bombay, of which 50,000 are regularly licensed. Of palmyra palms there are said to be 47,810 trees in Surat alone, of which 16,739 are regularly tapped. Of *Caryota* palms there are 70,000 trees, of which about 20,000 are tapped, 48,000 of these occur in Kánara, 21,672 in Kolába, and the remainder in Ratnágiri.

In a recent report on the trade in Indian sugar issued by the Revenue and Agricultural Department, no mention is made of palm sugar being

The Cocoa-nut Palm: Sugar.

COCOS
nucifera.

prepared in Bombay, so that it may be inferred the trees licensed to be

PALM SUGAR.

	Acres.
Palmyra	24,900
Cocoa nut	5,700
Date	1,600
	32,200

The writer of that report adds: "In 1834-85 and 1885-86 the area under cocoa-nut, date palms, and palmyras was 31,000 acres and 28,000 acres

palm. Taking the customary estimate of 100 trees to the acre, we arrive at the conclusion that out of a total of 7,776,500 trees, 570,000 were tapped, or perhaps only tapped for sugar, others being tapped for toddy. There exists in all the works and reports the writer has been able to consult the greatest possible confusion as to whether or not the trees may be tapped for sugar without paying the license levied on the tappings made with the view to the preparation of the beverage. It would be instructive to know if the 5,700 acres of cocoa-nuts in the above statement of Madras are exclusively set apart for sugar, and are independent of the trees spoken of in excise reports as licensed for the preparation of toddy. If every tree tapped has to pay the heavy tax imposed on the preparation of the toddy, it might fairly be inferred that the failure to develop a palm-sugar industry proceeded to some extent from that fact. But there are many other difficulties to the creation of a large trade in palm sugar. In this respect the following passage will be found instructive:—

"From time immemorial (*sic*) the natives of Ceylon have known* the juice of the cocoa-nut. Of a letter from the information as to palms for sugar-ter, receiving considerable assistance who, when we last heard of him, was it occasion he sent us a quantity of

cial principles. An experiment might be tried, however, labour being economised by the use of ladders, perhaps, and a larger use than the natives make in toddy-drawing, of safe passages from tree to tree," (*Tropical Agriculturist*, 1881-83, 568.)

* De Gandolle, quoting from Seeman, says, upon a rock near Point de Galle may be seen "the figure of a native prince, Kotah Roya, to whom is attributed the discovery of the uses of the cocoa-nut, unknown before him, and the earliest chronicle of Ceylon, the *Marawansa*, does not mention this tree, although it carefully reports the fruits imported by different princes."

COCOS
nucifera.

PALM SUGAR

The Cocoa-nut Palm: Sugar.

PALM SUGAR

Instead of being fermented, the liquor may be evaporated down and its sugar thus extracted "Eight gallons of sweet toddy, boiled over a slow fire, yield 2 gallons of a lusciously-sweet liquid, which is called jaggery or sugar-water, which quantity being again boiled, the coarse brown sugar called jaggery is produced. The lumps of this are separately tied up in dried banana leaves" (Royle). Dr Shortt says: "The sap is poured into large pots over an oven, beneath which a strong wood-fire is kept burning, the dead fronds and other refuse of the plants being used as fuel. The sap soon assumes a dark brown semi-viscid mass, well known as jaggery or gur, which whilst warm is poured into earthen pots or pans for preservation. Ten to twelve seers of the sap yield one of jaggery, the value of a maund of this jaggery is about 2 rupees. In this state it is sold to abkari contractors, sugar refiners, or merchants. The sugar refined comprises several sorts, known in the market as moist, raw, coarse, and fine sugar. The jaggery is placed in baskets and allowed to drain; the watery portion or molasses dropping into a pan placed below. This is repeated, so that the jaggery or sugar becomes comparatively white and free from molasses. This sugar—for so it may now be called—is put out to dry, and the lumps broken up, when dry it is termed raw sugar, and weighs about 25 per cent of the whole mass, the rest of it being collected in the form of molasses." Thus cocoa-nut sugar is chiefly met with in the form of jaggery. It is well known, however, that it is capable of being refined according to European principles, and a certain amount of cocoa nut sugar is regularly prepared. "The success of Dr J. N. Fonseca (author of the *History of Goa*), in converting toddy of the cocoa-nut tree into crystallized sugar, has been hailed with satisfaction by the press at Goa, and flattering calculations are made of the advantages that will accrue to the country from the development of this new industry" (*Bombay Gazette*). A similar sugar is prepared from the date-palm, from the palmyra-palm, and from the Indian sago-palm (*Caryota urens*). The date palm is very largely used for this purpose in Bengal, and the cocoa nut and palmyra palms in Madras, while in Bombay, apparently, sugar is only very occasionally made from the juices of these trees, but when extracted it is most generally prepared from the palmyra or *Caryota* palms. Some years ago the Government of Bombay, getting alarmed at the growth of the habit of toddy-drinking, brought Jessore sugar manufacturers to try the experiment of preparing sugar from the date-palms of the western presidency. According to the returns of the Surat district there are in that district alone 1,193,901 date palm trees, of which 489,395 were tapped in 1867-68. But it was found that the returns from sugar manufacture were so poor, as compared to the profits from the sale of *tari*, that the experiment practically failed. It is not known whether or not sugar to any appreciable extent is actually prepared from the Bombay palms, nor even whether a license is necessary to tap trees for sap intended to be so used. Of the Thána district it is said "Coarse sugar or gur is also made by boiling the juice in an earthen pot over a slow fire." It is worth recording that, according to the Gazetteers, there are 3,500,000 cocoa-nut trees in Bombay, of which 50,000 are regularly licensed. Of palmyra palms there are said to be 47,810 trees in Surat alone, of which 16,739 are regularly tapped. Of *Caryota* palms there are 70,000 trees, of which about 20,000 are tapped. 48,000 of these occur in Kánara, 21,672 in Kolába, and the remainder in Ratnagiri.

In a recent report on the trade in Indian sugar issued by the Revenue and Agricultural Department, no mention is made of palm sugar being

The Cocoa-nut Palm Sugar.

COCOS
nucifera.

PALM SUGAR

prepared in Bombay, so that it may be inferred the trees licensed to be tapped are employed entirely in the supply of toddy. It is noteworthy, in passing, that it should pay the Bengal and Madras people to make sugar

	Acres
Palm-yras	21,700
Cocoa-nut	5,700
Date	1,700
	<hr/> 32,700

The writer of that report adds: "In 1884-85 and 1885-86 the area under cocoa-nut, date palms, and palm-yras was 31,700 acres and 29,000 acres respectively, and the output 2260 lakhs maunds and 1098 lakhs maunds. The total quantity of jaggery produced from cocoa-nuts, &c., is apparently more than that obtained from sugar-cane." In a special report on the cocoa-nut issued by the Revenue and Agricultural Department in 1886 it was estimated that there were 7,7765 acres under that palm. Taking the customary estimate of 100 trees to the acre, we arrive at the conclusion that out of a total of 7,776,500 trees, 570,000 were tapped, or perhaps only tapped for sugar, others being tapped for toddy. There exists in all the works and reports the writer has been able to consult the greatest possible confusion as to whether or not the trees may be tapped for sugar without paying the license levied on the tappings made with the view to the preparation of the beverage. It would be instructive to know if the 5,700 acres of cocoa-nuts in the above statement of Madras are exclusively set apart for sugar, and are independent of the trees spoken of in extant reports as licensed for the preparation of toddy. If every tree tapped has to pay the heavy tax imposed on the preparation of the toddy, it might fairly be inferred that the failure to develop a palm-sugar industry proceeded to some extent from that fact. But there are many other difficulties to the creation of a large trade in palm sugar. In this respect the following passage will be found instructive:—

"From time immemorial (sic) the natives of Ceylon have known" how to produce crystallized sugar from the inspissated juice of the cocoa-nut spathe. About thirty years ago, in consequence of a letter from the late Mr J. Glanville Taylor, of Battersea, asking for information as to the probable success of attempting to utilize cocoa-nut palms for sugar-making, we went fully into the matter, receiving considerable assistance from Mr. D. O. Amesekere, a proctor who, when we last heard of him, was practising at Kurunegala. On that occasion he sent us a quantity of

scale will not pay Europeans when the matter is entered into on commercial principles. An experiment might be tried, however, labour being economised by the use of ladders, perhaps, and a larger use than the natives make in toddy drawing, of safe passages from tree to tree." (*Tropical Agriculturist*, 1881-83, 568)

The Cocoa-nut Palm: Spirit.

COCOS
nucifera.

SPIRIT.

"Dr. Lyon finds that in toddy collected in pots which have previously been used, fermentation commences before the pots are removed from the tree. The toddy appears to attain its maximum strength within 24 hours after removal from the tree. The volume of toddy yielded is greater during the twelve night than twelve day hours. Comparing trees of the

to Spirits.

Vinegar from Palm Wine.—Nearly every writer who has dealt with the subject of the useful products of the cocoa-nut palm has mentioned the preparation of the useful product of the juice, tillation, it is said, twenty the acetous fermentation being allowed to ferment,

VINEGAR.
I629

STRUCTURE OF THE WOOD.

TIMBER.
I630

Outer wood close-grained, hard, and heavy. Vascular bundles black and small, closely packed, and the wood is of the same color.

possesses great elasticity, and is for this reason particularly well adapted for temporary stockades which are exposed to cannon-shot." (*Drury*.)

DOMESTIC SACRED USES.

DOMESTIC.
I631

So many of these have already been alluded to that it is scarcely necessary to attempt to enumerate the thousand and one uses to which the palm is put by the people of India. Under sugar or *jaggery* on the opposite page.

interesting uses of the This art is much being much ad- water-bowl of their smoking-pipes or *hukah*. In Madras these shells are

Hukah
Bowls.
I632

a graphic account of the manner in which the cocoa-nut enters into the every-day life of the people of the tropics:—

Dickens in *Household Words* says: "To a native of Ceylon the

C. 1636

COCOS
nucifera.

The Cocoa-nut Palm: Domestic Appliances.

DOMESTIC

cocoa-nut palm calls up a wide range of ideas, it associates itself with nearly every want and convenience of his life. It might tempt him to assert that if he were placed upon the earth with nothing else whatever to minister to his necessities than the cocoa-nut tree, he could pass his existence in happiness and content. When the Cingalese villager has felled one of these trees after it has ceased bearing (say in its seventieth year), with its trunk he builds his hut and his bullock-stall, which he thatches with its leaves. His bolts and bars are slips of the bark, by which he also suspends the small shelf which holds the stock of home-made utensils and vessels. He fences his little plot of chillies, tobacco, and fine grain with the leaf-stalks. The infant is swung to sleep in a rude net of coir string made from the husk of the fruit, its meal of rice and scraped cocoa-nut is boiled over a fire of cocoa nut shells and husks, and is eaten off a dish formed of the plaited green leaves of the tree with a spoon cut out of the nut-shell. When he goes a fishing by torch-light, his net is of cocoa-nut fibre, the torch, or *chute*, is a bundle of dried cocoa-nut leaves and flower-stalks, the little canoe is a trunk of the cocoa palm tree, hollowed by his own hands. He carries home his net and his string of fish on a yoke, or pings, formed of a cocoa nut stalk. When he is thirsty he drinks of the fresh juice of the young nut, when he is hungry he eats its soft kernel. If he has a mind to be merry, he sips a glass of arrack, distilled from the fermented juice of the palm, and dances to music of rude cocoa-nut castanets, if he be weary he quaffs 'toddy,' or the unfermented juice, and he flavours his curry with vinegar made from this toddy. Should he be sick, his body will be rubbed with cocoa nut oil, he sweetens his coffee with *jaggery* or cocoa-nut sugar, and softens it with cocoa-nut milk, it is sipped by the light of a lamp constructed from a cocoa-nut shell and fed by cocoa nut oil. His doors, his windows, his shelves, his chairs, the water-gutter under the eaves, are all made from the wood of the tree. His spoons, his forks, his basins, his mugs, his salt-cellars, his jars, his child's money-box, are all constructed from the shell of the nut. Over his couch when born and over his grave when buried, a branch of cocoa-nut blossoms is hung to charm away evil spirits. This is, of course, a European picture some of the illustrations being scarcely in accordance with fact. It is, however, a true picture of the all importance of the "Prince of Palms" to the inhabitants of the tropical regions.

In order to convey some idea of the numerous uses of the cocoa-nut palm, the following extract from the Colonial and Indian Exhibition Catalogue may be here reproduced. It is a list of certain articles prepared from the palm, exhibited by Mr M O Pereira, Head Assistant to the Government Medical Storekeeper, Bombay.—

- (1) *Cour (Kabal, Katha)*—The fibre made of cocoa-nut husk, in this state it is used for stuffing cushions, pillows, beds, making rope mats, &c
- (2) *Spoon (Ukk)*—Used in the cook-rooms of Europeans, and by the natives for drinking gruel (rice *conji*), has the advantage over the metallic one of not being corroded.
- (3) *Drainer (Zard)*—Used for draining food fried in *ghí* (clarified butter) or oil.
- (4) *Ladle (Doho)*—Used for water.
- (5) *Ladle, small (Buddi)*—Used by natives for taking out oil for daily use from an earthen vessel containing the yearly or quarterly stock. It is not corroded by the oil.
- (6) *Hubble bubble (Gudgudi)*.—This is the *hukah* of the poorer classes.
- (7) *Beads (Mami)*
- (8) *Vinegar (Sirka Amt)*—Made of the juice (*toddy*) of the cocoa-nut palm.

The Cocoa-nut Palm: Domestic Appliances.

COCOS
nucifera.

DOMESTIC.

- (9) Pickle (*Lonche, Achār*)—Made of the pith of the top of the fresh tree the same palm.
- (10) " " " " " "
- (11) " " " " " " leaf.
- (12) Broom, Goa (*Kersunt, Butarā, Zadd*)—Made of leaf-ribs, it is much used for sweeping purposes.
- (13) Strainer (*Mandorā*)—The sheaths by which the leaves are held firm to the tree. Used for straining cocoa-nut juice (*toddy*) and cocoa-nut milk, and for general straining in the cook-room.
- (14) Woolly floss (*Burā*)—Much used as a styptic for cuts by the *toddy* drawers and cultivators.
- (15) Blossom (*Kontī*)—The blossom in the state when it is tapped for draining juice (*toddy*).
- (16) Chain (*Sinkli Kargodā*).—Used round the waist to retain the loin cloth. The size is for a child. Set in metal may be used as a watch guard.
- (17) Drum (*Dholki*)—Made of a piece of the trunk of the cocoa-nut tree.
- (18) Wood piece of rafter (*Barod Wānsa*).—Made of the lower part of the tree 10, 20, and 25 feet in length.
- (19) Oil (*Khebrēl*)—Oil expressed in the native mills for commerce.
- (20) Oil (*Muthēl*)—Oil extracted from fresh cocoa-nuts by rasping fine, and or by internally results.
- (21) F " " " " " "
- (22) Liquor (*Daru, Rashī Urakhi*)—Spirituous liquor 60° U.P., distilled
- (23) P " " " " " "
- of the Portuguese. There is no native name for it, and it is only known to the Native Christians of Bombay. Drunk hot for a cold, one or two cups.
- (24) Liquor (*Fhenidarū Port Dobrado*) (*double*)—Liquor made of cocoa-nut (*toddy*) juice by redistillation 20° U.P., formerly much used for making medicinal tinctures and country brandy.
- (25) Cocoa-nut (*Vārel*)—This fruit takes a year to ripen.
- (26) Sweetmeat (*Nārlipak*)—Prepared from the kernel of the nut.
- (27) Sweetmeat—Prepared from the kernel with saffron.
- (28) Splints (*Kambī*)—Made of (*poguy*) the spathe of the blossom used for this purpose by the *toddy* drawers and natives of Goa, &c.
- (29) Door mats.—Made of the fibre of many shapes and sizes by natives and in the jails.
- (30) Buggy mats.—Made of the fibre of many shapes and sizes by natives and in the jails.
- (31) Carriage mats.—Made of the fibre of many shapes and sizes by natives and in the jails.
- (32) Floor mats—Made in Malabar and in the Bombay jails of different sorts and colours.
- (33) Cage (*Pinjara, Khuri*)—Made of the rib of the leaf.
- (34) Horn (*Pipāni Tontora*)—Made of the leaf of the palm; gives a loud sound when fresh.
- (35) Horn, small size (*Shakti Pipāni*)—Made of the leaf of the palm, gives a loud sound when fresh.
- (36) Toy parrot (*Papāt*)—Made by children of the leaf of the palm; when new it looks better.

COCOS
nucifera.

The Cocoa-nut Palm: Domestic Appliances.

DOMESTIC

cocoa-nut palm calls up a wide range of ideas; it associates itself with nearly every want and convenience of his life. It might tempt him to assert that if he were placed upon the earth with nothing else whatever to minister to his necessities than the cocoa-nut tree, he could pass his existence in happiness and content. When the Cingalese villager has felled one of these trees after it has ceased bearing (say in its seventieth year), with its trunk he builds his hut and his bullock-stall, which he thatches with its leaves. His bolts and bars are slips of the bark, by which he also suspends the small shelf which holds the stock of home-made utensils and vessels. He fences his little plot of chillies, tobacco, and fine grain with the leaf-stalks. The infant is swung to sleep in a rude net of coir string made from the husk of the fruit; its meal of rice and scraped cocoa-nut is eaten off a dish-
 spoon cut out of the
 net is of cocoa-nut
 leaves and flower-
 hollowed by his o-

tilled from the fermented juice of the palm, and dances to music of the

us toddy
 sweetens
 a-nut sugar, and softens it with cocoa-nut
 ht of a lamp constructed from a cocoa-nut
 His doors, his windows, his shelves, his

chairs, the
 the tree
 jars, his
 Over his couch when born and over his grave when buried, a branch of
 cocoa-nut blossoms is hung to charm away evil spirits. This is, of
 course, a common practice, some of the illustrations being scarcely in
 accord
 of the

palr
 Catalogue may be here reproduced. It is a list of the
 M. M. C. Pereira. Head Assistant to the

husk, in this state
 ing rope mats, &c.
 peans, and by the
 ie advantage over

ht (clarified butter)

or oil

(4) Ladle (*Dohio*)—Used for water.

(5) Ladle, small (*Buddi*)—Used by natives for taking out oil for daily
 use, and for the yearly or quarterly stock.

(6)

(7)

(8)

palm.

kah of the poorer classes.

(toddy) of the cocoa-nut

The Cocoa-nut Palm: Domestic Appliances.	COCOS nucifera.
(9) Pickle (<i>Lanche, Achár</i>)—Made of the pith of the top of the fresh tree	DOMESTIC.
(10)	
(11)	
(12)	leaf-ribs; it is
(13)	• are held firm •) and coco-
(14)	• by the <i>toddy</i>
(15)	is tapped for drawing juice (<i>toddy</i>)
(16) Chain (<i>Sinkli Kargola</i>).—Used round the waist to retain the loin cloth The size is for a child Set in metal may be used as a watch- guard.	
(17) Drum (<i>Dholki</i>)—Made of a piece of the trunk of the cocoa-nut tree	
(18) Wood piece of rafter (<i>Barat Il'ansi</i>).—Made of the lower part of the tree 10, 20, and 25 feet in length.	
(19) Oil (<i>Khohrel</i>)—Oil expressed in the native mills for commerce.	
(20) Oil (<i>Muthel</i>)—Oil extracted from fresh coco-nuts by rasping fine, drying, and pressing between coir and twisting with hands or by mill	
(21)	
(22)	lled
(23) P one or two cupfuls.	
(24) Liquor (<i>Fhemadrú Port Dobrado</i>) (<i>double</i>)—Liquor made of coco- nut (<i>toddy</i>) juice by redistillation 20° U.P.; formerly much used for making medicinal tinctures and country brandy.	
(25) Cocoa-nut (<i>drel</i>)—This fruit takes a year to ripen.	
(26) Sweetmeat (<i>Nárlipak</i>)—Prepared from the kernel of the nut.	
(27) Sweetmeat.—Prepared from the kernel with saffron	
(28)	used
(29)	atives and in the jails
(30) Buggy mats—Made of the fibre of many shapes and sizes by natives and in the jails.	
(31) Cabbage mats.—Made of the fibre of many shapes and sizes by natives and in the jails	
(32) Floor mats.—Made in Malabar and in the Bombay jails of different sorts and colours	
(33) Cage (<i>Pinjara, Khursi</i>)—Made of the rib of the leaf.	
(34) Horn (<i>Pipani Tontora</i>)—Made of the leaf of the palm; gives a loud sound when fresh.	
(35) Horo, small size (<i>Dhakti Pipani</i>)—Made of the leaf of the palm; gives a loud sound when fresh.	
(36) Toy parrot (<i>Popat</i>)—Made by children of the leaf of the palm; when new it looks better.	

COCOS
nucifera.

The Cocoa-nut Palm : Domestic Appliances.

DOMESTIC.

- (37) Toy parrot in cage (*Piniayut Pannat*).—Made of the leaf of the pa
- (38) Leaf woven, C houses; has
- (39) Root (*Mál*).—Used medicinally, astringent, and as a gargle for sore mouth.
- (40) Rope (*Káthá, Sumbha*).—This is extensively used.
- (41) Oil-bottle (*Dowlá*).—Hung beneath the labour-cart with castor oil and
- (42) ingent;
- (43) catch-
igation
- purposes (model).
- (44) Conduit (*Panhál*).—A conduit put under the hole of the trough for conveying water for irrigation purposes.
- (45) Adapter (*Nalá*).—Piece of the adapter used for connecting the native still to the condenser.
- (46) (*Tuntuna*).—Native musical instrument, used by the poorer classes.
- (47) Beam (*Bádhá*).—Piece of beam of the shape used for houses. It is also used for fishing-stakes in the sea; generally two cocoa-nut trees make a stake 60 to 70 feet long.
- (48) Rosary box.—Made of immature cocoa-nuts.
- (49) Charcoal Powder (*Kolá*).—Burnt shell used for preparing black and lead-coloured washes for houses.
- (50) Broom (*Zidá*).—Made of the ribs of the leaf; used by the Bombay
- (51) used
in the
helds.
- (52)
- (53)
- (54)
- (55)
- (56)
- (57) Fi
horses.
- (58) Tar with acetic acid (*Karítá*).—Made by burning the shells in a
small hole in the bottom placed on another heated by
- (59)
- (60)
- (61)
- (62)
- (63)

The Cocoa-nut Palm : Domestic Appliances.

CODONOPSIS
ovata.

- (54) Husk (*Sil, Chirad, S-dm*).—Used as fuel. Especially for tacking purposes also affords coir fibre.
- (55) Scoops.—Made of the shell. The round and deep ones are used as drinking cups.
- (56) Neck belts (*Pattā*).—Used for yoking bullocks and buffaloes to carts, ploughs, oil-mills, &c.
- (57) Sack (*Thattī Pāt*).—Used for sending out articles; a somewhat similar one is attached to the cart for carrying straw or grass.
- (58) Teeth-brushes (*Lam*).—The pedicels of the blossom are used as tooth-brushes.
- (59) Brushes (*Kamhā, Kachrā*).—The pedicels of the blossom are used for whitewashing houses, &c.
- (60) Blind (*Lal-Dhapan*).—Used for blinding bullocks and buffaloes while yoked to the Persian wheel, oil-mill, &c.
- (61) Nest (*Gharā, Gharhā*).—Made by birds out of the fibre of the leaf.
- (62) Soap (*Saba*).—Made of cocoa-nut oil; has larger percentage of water than any other soap.
- (63) Fumies and toys.—Rings, whips, neckties, rattles, crosses, &c.
- (64) Bats for cricket.—Made of the wood (cocoa-nut).
- (65) Oil-cakes (*Fend*).—Oil-cake from the native mill.
- (66) Pinnar (ship) (*Fatnār*).—Toy made by the boys of the fishermen class.
- (67) Boat, fishing (*Boat*).—Toy made by the boys of the fishermen class.
- (68) Kernel (*Khobri*).—Dry kernel.
- (69) Stem (*Fritā*).—Used as broom.
- (70) Charpai, Cot (*Khā, Eṣ*).—Used by the natives (model).
- (71) Potash (oxide) (*Khūr*).—The ash of the stem of the leaves; they produce 20 per cent. of ash.
- (72) Cocoa-nut, abortive (*Vānā Nārel, Vānā*).—Used as floats for beginners in swimming.
- (73) Spadix.—The spadix prepared for drawing juice (*taddy*). A thin slice is cut from the palm stem three times a day. The juice flows from this and drips down into an earthen pot suspended on purpose. A small piece of the leaf is fixed above to prevent the bottom of the pot from touching the point, the sheath of the leaf covering the mouth of the pot to keep out flies.

DOMESTIC.

Codilla.—A commercial term for the refuse separated on cleaning hemp or flax fibres.

1637

CODONOPSIS, Wall.; Gen. Fl., II., 557.

[t. 60. fig. 3; CAMPANULACEÆ.

Codonopsis ovata, Eent.; Fl. Er. Ind., III., 413; Royle, II., 253.
Vern.—Lūlā.

1638

Habitat.—A herbaceous plant common in the N. W. Himalaya from Kashmir to Garhwal at altitudes from 8,000 to 12,000 feet, distributed into Afghanistan.

Medicine.—Archibison (*Karun Valley Flora, in Ann. Soc. Jour., XII., 1871*, says:—"The roots and leaves of Codonopsis are made into poultices and employed in the treatment of bruises, ulcers, and wounds."

MEDICINE
1639

Food.—"The large two-root is ground into flour and eaten in 'Labul' (*Sweet; dibhān*). In Karun it is said to be eaten raw or cooked."

FOOD
1640

COCOS nucifera.	The Cocoa-nut Palm : Domestic Appliances.
DOMESTIC.	
(37)	Toy parrot in cage (<i>Pinjarydt Popat</i>).—Made by children from the
(38)	leaf of the
(39)	houses;
(40)	Root (<i>Mál</i>).—
(41)	mouth.
(42)	Rope (<i>Káthá, Sumbha</i>).—This is extensively used.
(43)	children are fond of it.
(44)	Trough (<i>Panshira</i>).—Trough made of cocoa-nut tree, used for catching
(45)	water drawn from a well with a Persian wheel for irrigation
(46)	purposes (model).
(47)	Conduit (<i>Panhál</i>).—A conduit put under the hole of the trough for
(48)	conveying water for irrigation purposes.
(49)	Adapter (<i>Nalá</i>).—Piece of the adapter used for connecting the native
(50)	the poorer classes,
(51)	ed for houses. It is
(52)	also used for fishing-stakes in the sea; generally two cocoa-nut
(53)	trees make a stake 60 to 70 feet long.
(54)	Rosary box.—Made of immature cocoa-nuts.
(55)	Charcoal Powder (<i>Kolsá</i>).—Burnt shell used for preparing black and
(56)	imbay
(57)	used
(58)	on the
(59)	fields.
(60)	Made of the stem of the leaf
(61)	
(62)	
(63)	
(64)	
(65)	
(66)	
(67)	
(68)	horses.
(69)	Tar with acetic acid (<i>Kartel</i>).—Made by burning the shells in a
(70)	pot with a small hole in the bottom, placed on another, heated by
(71)	fire on all sides. Used by the natives for ringworm and skin diseases.
(72)	Rope (<i>Dore</i>).—Made of various sorts and sizes.
(73)	Brush (<i>Chavár</i>).—Made of the husk of the nut for cleaning sieves,
(74)	washing baskets and rice-drainers (<i>Shibum</i>).
(75)	Sugar, molasses (<i>Gal</i>).—Made of the juice (<i>toddy</i>) in Goa.
(76)	(<i>Band</i>).—Peeled from the outer part of the stem of the leaf. Is used
(77)	the higher classes of
(78)	day. At weddings

COFFEA
arabica

Coffee

COFFEA, Linn , Gen Pl, II, 114

[RUBIACEAE

1641

Coffea arabica, Linn , Fl Br Ind, III, 153, Wight, Ic, t. 53,

COFFEE, Eng , CAFÉ Fr , KAFFEE, Germ

Vern —Bun (the berry), Kawa (the berry),
 bun, bun, coffee coff,
 Kawa, bun, kahwa, bu
 MAR Bund, tochem k
 capi TA
 kaphi,
 ARAB,
 kaphi si,
 kura, sawa kopi, MALA,
 gahwa, kahwa kuehwa,
 kahwa, PERS, Ka-pwol,

References —Roxb Fl Ind, Ed C B C, 181, Brandis, For Fl, 276,

Coffee Cultivation.

COFFEA
arabicaCULTIVA-
TION.

Habitat—Most authors seem to agree that the coffee plant is indigenous to Abyssinia, the Soudan, and the coasts of Guinea and Mozambique. "Perhaps in these latter localities, so far removed from the centre, it may be naturalised from cultivation. No one has yet found it in Arabia, but this may be explained by the difficulty of penetrating into the interior of the country. If it is discovered there it will be hard to prove it wild, for the seeds, which soon lose their faculty of germinating, often spring up round the plantations and naturalise the species. This has occurred in Brazil and the West India Islands, where it is certain the coffee plant was never indigenous" (*De Candolle*).

It is a small, much branched tree or bush 15 to 20 feet in height, with whitish bark and white orange-like flowers. The fruit, which is red on ripening, is about the size of a small cherry, and contains two seeds, closely united. These, on being separated, constitute the coffee berries of commerce, and on being roasted and ground, the coffee of the shops.

1 In India *Coffea arabica*—the coffee plant—is largely cultivated, but other species are also met with.

2 *C. bengalensis*, *Roxb.*, occurs from Kumáon to Mishmī, also in Bengal (*Horn*).

3 like the two last.

4 *C. Jenkinsi*, *Hook f.*, Khási Mountains. Fruit and seeds different from the last, being ellipsoid.

5 *C. khasiana*, *Hook f.*, Khási and Jaintia hills. Fruit $\frac{1}{2}$ inch in diameter, smooth, seeds ventrally concave.

6 *C. travancorensis*, *W & A.*, occurs in Travancore. Fruit broader than long.

7 *C. Wightiana*, *W & A.*, the Western Peninsula, in and places from Coorg to Travancore. Fruit much broader than long, with a deep furrow.

With the exception of the first these species are not of any special economic importance, and very little coffee is grown in the tracts in which they are reported to be found. The coffee cultivating region in this country is Southern India, and the enterprise has there gained much importance. It at present not only supplies most of the coffee consumed in India, but exports large quantities to other countries.

(For Liberian Coffee see the concluding paragraph of this article.)

HISTORY OF COFFEE CULTIVATION AND OF THE HABIT OF COFFEE DRINKING

The regions best suited for coffee cultivation lie between 15° N and 15° S latitudes, but it is grown as far as the 36° N to the 30° S in regions where the temperature does not fall beneath 55° F (13° C). The area of its cultivation is in fact very nearly the same as that of cotton. Within the tropical region it may be cultivated at the level of the sea or even much further to the north and south of the equator than has been indicated. The plant manifests, in other words, a remarkable power of endurance, but it does not follow that where it may be grown as an ornamental garden bush it may there afford the commercial product. Within the tropics it will yield profitable returns only

COFFEE CUL-
TIVATION.
1642

COFFEE
arabica.

Habit of Coffee-drinking.

HISTORY.

climate within the tropics is that required. An atmosphere resembling that of an English hot-house produces the finest crops, but it is inimical to the planter and favourable to weeds. The climate is therefore that which Europeans prefer to that which is essential for tea cultivation. Heavy clouds, strong winds blow away the flowers and make 50 per cent. loss. If too hot and dry, the plants require shade, and if strong winds prevail during the flowering season, belts of forest have to be left to protect the plantation. This is regarded an important consideration in clearing land for a coffee plantation. Dr. Shortt says: "In low countries there is not sufficient moisture in the soil, and when shaded and irrigated, it produces a coarse and uneven bean devoid of the peculiar aroma essential to good coffee." While the coffee plant does not seem to luxuriate on the immediate coast and under the direct influence of the sea breezes, still it is a noteworthy fact that in India the best gardens (such as those of the Nilghiris, the Wynnad, Mysore, Coorg, Mungerabad, and Shevaroy) bear a certain relation to the coast, indeed few good plantations occur beyond the limits of marine influence. On this account the recommendations of the early advisers of the Government of India to prosecute experimental coffee cultivation on the lower Himalaya from Darjiling to Kumáon have been abandoned. The occurrence of certain wild species on the mountains of Northern and Eastern India has been shown to afford no criterion of the possible regions where the African plant might be successfully grown. Coffee-planting has in fact been practically concentrated on the lower mountain slopes of South India, a region which like Ceylon has many features in common with the Abyssinian and other African regions where the wild coffee abounds. Some parts of the Nilghiri hills are, however, found to be too high, the plants growing well, but not maturing their seeds.

It has been stated that the coffee plant of commerce is truly wild in Abyssinia, and that it is there called *dun* or *bout*. This name appears to have followed it into Egypt and Syria. Bellus and Alpin both write of it under that name, and state that the Egyptians extract the drink called *café* from the seeds. A reference to the vernacular names in a preceding paragraph will show that both these names are used in India and occur also in the Arabic and Persian languages. Yule and Burnell remark: "There is very fair evidence in Arabic literature that the use of coffee was introduced into Aden by a certain Sheikh Shihabuddin Dhabhani, who had made acquaintance with it on the African coast, and who died in the year H 875, i.e., A.D. 1470, so that the introduction may be put about the middle of the fifteenth century—a time consistent with the other negative and positive data. From Yemen it spread to Mecca (where there arose after some few years, in 1511, a crusade against its use as unlawful), to Cairo, to Damascus and Aleppo, and to Constantinople, where the first coffee-house was established in 1554. The first European mention of coffee seems to be by Ranwolff, who knew it at Aleppo in 1573." (Conf. with remarks in a further page regarding introduction into India.)

The habit of coffee-drinking spread but slowly from Arabia Felix, but in the Mahomedan countries through which it became gradually diffused, it soon met with the opposition of the priests, owing to the coffee-houses having become more popular than the mosques. To check this, the article was heavily taxed. The first mention of a coffee-shop in Great Britain occurs in 1652. (Tea was publicly sold in London in 1657.) Mr. D. Edwards, a Turkey merchant, acquired the habit of drinking coffee and imported a Greek servant, Pasqua Rossie, for the purpose of preparing his favoured beverage. His friends grew so fond of it that to prevent their

Consumption of Coffee.

COFFEA
arabica.

HISTORY.

sustained in Constantinople. Charles II. (in 1675) viewed these shops as the meeting-places for dissipated persons, and a royal proclamation was issued for their suppression. Coffee is spoken of as being in use in France in 1610, and the first public café was opened in Paris in 1669. Shortly after, it became general throughout Europe. It may be here added that of the three great dietary beverages Cocoa was the first to make its appearance in Europe, coming from South America.

lative measures appear to have had much to say to the growth of a greater coffee consumption in continental countries than in England, or rather to the decline of coffee consumption manifested in Great Britain with the growth of the tea demand.

DECLINE OF CONSUMPTION IN BRITAIN.—The consumption of coffee in Great Britain was, in 1847, 37,441,373lb; in 1857, 34,518,555lb; in 1867, 31,567,760lb; but in 1874 it had declined to 31,859,408lb, and slightly improved in 1880, being in that year 32,480,000lb. These figures must not be confused with the imports of coffee. Great Britain does an immense trade in importing and re-exporting the beans or in exporting special preparations of coffee. The imports into Great Britain average from 130 to

BRITAIN.
Decline in
Consumption.
1643

example, from 1857 to 1859, it was 1½lb, from 1865 to 1867 it was 1lb, and

Empire consumes the greatest amount. Holland takes 21lb per head, Denmark 14lb, Belgium 13½lb, Norway 9½lb, Switzerland 7lb, Sweden 6lb, France 2½lb, Austro-Hungary 2lb, Greece 1½lb, Italy 1lb, the United Kingdom ¾lb, and European Russia ¾lb. The United States of America are supposed to use on an average 8lb per head of population per annum. Mr. H. Pasteur, in his report on the coffee shown at the

COFFEA
arabica.

Habit of Coffee-drinking.

HISTORY.

climate within the tropics is that required. An atmosphere resembling that of an English hot-house is necessary.

During the growing season, belts of forest have to be left to protect the plantations. The land here is not fertile, and produces little of value.

good coffee. While the coffee plant does not seem to luxuriate on the immediate coast and under the direct influence of the sea breezes, still it is a noteworthy fact that in India the best gardens (such as those of the Nilghiris, the Wynnad, Mysore, Coorg, Munggerabad, and Shevaroy) bear a certain relation to the coast; indeed few good plantations occur beyond the limits of marine influence. On this account the recommendations of the early advisers of the Government of India to prosecute experimental coffee cultivation on the lower Himalaya from Darjiling to Kumaon have been abandoned. The coffee plant is a native of the mountains of Abyssinia, and it is there called *bun* or *boun*. This name appears to have followed it into Egypt and Syria. Bellus and Alpin both write of it under that name, and state that the Egyptians extract the drink called *cafe* from the seeds. A reference to the use of coffee in a prehistoric age is made by Burnell, who states that the use of coffee was introduced into Aden by a certain Sheikh Shihabuddin, who brought it with him on the African coast and introduced it into the Arabian Peninsula. From Yemen it spread to India, and from India to the other negative and positive data. From Yemen it spread to India, and from India to the other negative and positive data.

Consumption of Coffee.

COFFEA
arabica.

HISTORY.

tion was issued for their suppression. Coffee is spoken of as being in use in France in 1640, and the first public café was opened in Paris in 1669. Shortly after, it became general throughout Europe. It may

With free trade in tea, the price of that article fell considerably, and the

been legalised, chicory, the most important of these, being made to bear a

growth of the tea demand.

DECLINE OF CONSUMPTION IN BRITAIN.—The consumption of coffee in Great Britain was, in 1847, 37,441,373lb; in 1857, 34,518,555lb; in 1867, 31,567,760lb; but in 1874 it had declined to 31,859,408lb, and slightly improved in 1880, being in that year 32,480,000lb. These figures must not be confused with the imports of coffee. Great Britain does an immense trade in importing and re-exporting the beans or in exporting special preparations of coffee. The imports into Great Britain average from 130 to

BRITAIN.
Decline in
Consumption.
1843

from 1875 to 1877 it had fallen to 1lb. Even where the consumption is in the ascendant (in non-coffee-producing countries) the increased consumption is not proportioned to the increase of population, so that in Europe at least the demand for coffee is not materially progressing. The German Empire consumes the greatest amount. Holland takes 21lb per head, Denmark 14lb, Belgium 13lb, Norway 9lb, Switzerland 7lb, Sweden 6lb, France 2lb, Austro-Hungary 2lb, Greece 1lb, Italy 1lb, the United Kingdom 1lb, and European Russia 1lb. The United States of America are supposed to use on an average 8lb per head of population per annum. Mr. H. Pasteur, in his report on the coffee shown at the

COFFEA
arabica.

Coffee Cultivation Extended.

HISTORY.

Colonial and Indian Exhibition in London, 1836, wrote: "The total production of coffee in the world is roughly estimated at about 600,000 to 650,000 tons, of which Brazil alone produces between 350,000 and 380,000 tons, and Java 60,000 to 70,000 tons; the proportion of British-grown coffee is not above one per cent, of which it contributes 15,000 to 18,000 ca 4,000 to 5,000 tons of our Colonies and of nce. Nowhere is finer blue, as well as that of kinds, even of Mocha, which at one time stood above all others."

EXTENDED
CULTIVA-
TION.
1644

EXTENDED CULTIVATION.—The cultivation of the coffee plant began to extend towards the end of the seventeenth century, being carried on in various countries possessing a sub-tropical climate, such as India, Java, Ceylon, Jamaica, and Brazil. Down to 1600, the only source of coffee-supply was the East Indies. The first coffee plant was introduced to the plant

plants grown
ernor of t
Gardens

of the first

ted in the Botanic
plant were sent to

however,
coffee
Louis
ough-
Java
Brazil
million

plants under careful cultivation. Coffee is also extensively grown in Costa Rica, Guatemala, Venezuela, Guiana, Peru, and Bolivia with Jamaica, Cuba, Porto Rico, and the West Indian Islands generally. Its cultivation has long been pursued in Queensland, and in various other

and India are the countries where its introduction has assumed an important commercial character.

CEYLON
Introduction.
1645

out was
ropean
Ceylon
fungus
spread

Indian Exhibition "represent only the fast vanishing remains of what was but nine years ago the most extensive and flourishing of the coffee crops raised on British soil by British enterprise and capital. The production, which in 1873 amounted to nearly 1,000,000 cwt, declined to 665,000

Introduction of Coffee Cultivation into India.

COFFEA
arabica.HISTORY.
INDIAN.

cwt in 1876, to 312,000 cwt. in 1884, and to 230,000 cwt in 1885" (Pasteur)

INTRODUCTION INTO INDIA.
into India is very obscure. At
Mysore some two centuries ago
Budan, who, on his return from
This tradition is so universal
greater part of South India, that there seems every chance that there may
be some foundation for it. Jan Huygen van Linschoten, a native of Hol-
land, who, under the protection and in the service of the Portuguese, visited
India in 1576 to 1590 (and wrote a most instructive account of his travels),
while describing all the important products of the Malabar Coast from

... the fruit,
... Egyptians
... hear of
... plant
... the pil-
... "The

plant has long been introduced into India, and coffee of a fine quality
is cultivated on the coast of Malabar, also to a considerable extent in
Coimbatore, and the cultivation might, no doubt, be easily extended else-
where. It was tried in the Calcutta Botanic Gardens, where it succeeded
remarkably well under the shade of the teak plantations, and nothing
could be more healthy looking or in better bearing than these coffee plants
when seen by the author in 1823. Dr. Roxburgh had long previous to

... seven years,
... of the dry
... Jamaica pro-
... mittee of the
House of Commons, stated: "I will say for myself I never used to drink
good coffee except that produced in the Company's garden at Calcutta."
Subsequent writers have, however, shown that while the plant can be

done. There are at present some 10 acres under coffee in Lohardugga

1830, but as a curiosity Major Bevan grew coffee in the Wynaad in
1822. It was cultivated by Mr. Cockburn on the Shevaroy's in 1830,
Mr. ... in 1840, the plant was
earlier, to Darjiling,
subsequently. It has
been reported to yield 9 maunds an acre in Chittagong, and that there are

COFFEA
arabica.

Coffee Cultivation—Locality

HISTORY.

thousands of acres of good suitable land for coffee near navigable rivers where manure and labour are cheap.

Coffee has also been introduced into Burma. For some time the effort to open out plantations seemed to be doubtful; and Mr. Pottley, speaking of the garden on the Kacen Hills, north-east of Loungeon, reported recently that much damage had been done by a mole cricket. Since then, however, the construction of a railway from Rangoon through a hopeful coffee region has given birth to new expectations. The Agri-Horticultural Society of

the demand was great for seed. Large numbers are reported to be added that "it is noteworthy that the Arabian variety does best on the Loungeon Hills, while at Tavoy the Liberian variety is alone thought worthy of cultivation." "Local being taken up along the lines of Tavoy, and gardens have been cultivating fruit and other useful trees as well as coffee."

METHODS.
I 647

METHODS OF CULTIVATION.

Space cannot be afforded to deal with every feature of this subject; the reader is referred to the numerous special publications quoted under the paragraph of references; only the more salient features will be touched upon, and especially those which have a bearing on the future expansion of the industry.

COFFEE CULTIVATION ON SOILS. THE SOIL FOR COFFEE CULTIVATION. The soil for coffee cultivation is of great importance. In the rising dense forests of the best land, has taken up a poor grassy or stony situation, and however much water he may have access to, his plants are stunted and soon become yellow, unless he resorts to heavy manuring at a very early stage, which materially in-

those on forest land, and are not so lasting. The berry produced on rich ferruginous clay is found to contain more aroma and the bean is heavier when compared with those of other localities. This fact is so well known

proximity to a river, subject to ups of paramount importance and should not be sacrificed for higher soil, as the latter can be artificially obtained much quicker than the former. In wooded country the estate may be laid out in blocks of 50 acres, encircled by

Coffee Cultivation—Seed.

COFFEA
arabica.

METHODS.

natural belts of forest. Flat land must be avoided, and wet soil is fatal to coffee, and flat lands would entail great expenditure for drainage. Steep slopes, on the other hand, are objectionable, on account of the wash occasioned by rains carrying away soil and manure and exposing the roots of the shrubs. The surface soil must be fairly good, the subsoil may be poor but must never be stiff clay, the shrub is essentially a lateral feeder. As a general rule virgin forest land has been found most suitable to break up for coffee estates, it has become naturally enriched by decayed vegetable matters, and the burning to which it is subjected frees it from insects and from weeds. Not only therefore do the opinions expressed in these two passages differ as to the degree of moisture which the soil should contain,—Dr Shortt saying it should "abound" and the writer in Spons' holding that moisture is "fatal"—but Dr Shortt remarks, the planter "must be in the enjoyment of robust health, to be able to withstand the deadly effects of a damp atmosphere, for, in all probability, he will have to spend his time surrounded by the direst malaria, &c." Spons', on the other hand, says—"The most suitable climate is precisely that which Europeans prefer. Frost, even though it be only at night and for a short period, is fatal." It seems probable that opinions have greatly changed.

just quoted from Dr. Shortt's work are much more applicable to Tea than to Coffee.

Nursery and Seed.—Having selected the site for a plantation, cleared and burned the trees (taking care, where necessary, to have protecting belts against prevalent winds), laid out the roads and carried the water-supply to the coffee-house, it next becomes necessary to select and prepare the spot for a nursery. The soil should have a gentle slope, be well drained but retentive of moisture, rich and within access of artificial or natural irrigation. The land should be thoroughly ploughed up or trenched to a depth of 18 to 24 inches and the weeds entirely exterminated. Manure at the rate of from 3 to 5 tons an acre should be worked into the surface soil. The seed-beds may be shaded, but not to the exclusion of the sun, nor to such an extent as to allow dripping from the protecting trees. Each bed should be raised to allow drainage, and separated from the others by narrow paths. If on sloping ground, a deep trench should be run round the top portion of the nursery so as to divert the surface water.

The seeds should be sown in rows 6—9 inches apart and about 2 inches

the morning or after sunset.

The selection of seed is of great importance. The stock should be taken from carefully cultivated, healthy, and vigorous plants from 7 to 10 years old and the seed should not be gathered until fully ripe. "A bushel of seed should give 20,000 to 30,000 plants, the best is parchment unwashed,

Nursery.
1648Seeds
1649

when fresh, at a depth of 1 inch, and cabbled in the soil in drills 10 to 12 inches apart from each other, so as to give the plantings plenty of room to grow, and subsequently enable the planter to remove them with facility from the nursery to the plantation, as the seeds may be sown in drills,

COFFEA
arabica.

Coffee Cultivation—Locality.

HISTORY.

thousands of acres of good suitable land for coffee near navigable rivers where manure and labour are cheap.

Coffee has also been introduced into Burma. For some time the effort to open out plantations seemed to be doubtful; and Mr. Petley, speaking of the garden on the Karen Hills, north-east of Toungoo, reported recently that much damage had been done by a mole cricket. Since then, however, the construction of a railway from Rangoon through a hopeful coffee region has given birth to new expectations. The Agri-Horticultural Society of Burma, in their annual report for 1887, say, the demand was great for seedlings, both of Arabian and Liberian coffee. Large numbers are reported to have been sent to Upper Burma. It is added that "it is noteworthy that the Arabian variety does best on the Toungoo Hills, while at Tavoy the Liberian variety is alone thought worthy of cultivation." "Local demands, too, are increasing, as land is being taken up along the lines of railway between Rangoon, Prome, and Toungoo, and gardens have been formed whereon small grantees are now cultivating fruit and other useful trees as well as coffee."

METHODS,
I 647

METHODS OF CULTIVATION.

Space cannot be afforded to deal with every feature of this subject; the reader is referred to the numerous special publications quoted under the paragraph of references, only the more salient features will be touched upon, and especially those which have a bearing on the future expansion of the industry.

LOCALITIES, CLIMATES, AND SOILS SUITABLE FOR COFFEE CULTIVATION AS AN AGRICULTURAL PRODUCT—Under the heading "History of Coffee," the subject of the region of coffee cultivation and the climate necessary have been discussed. Dr. Shortt says of soil: "This should be rich, abounding in moisture, and containing much humus or vegetable mould, consequently we find that the plant thrives best on either red or black clay, containing combinations or preparations of iron, and covered over with humus formed by the decay of vegetable matter produced by dense forests. When these points are overlooked, the results are soon seen in the rising plantation. The planter, perhaps, instead of choosing forest land, has taken up a poor grassy or stony situation, and however much water he may have access to, his plants are stunted and soon become yellow, unless he resorts to heavy manuring at a very early stage, which materially increases the expense of the concern. In hard rocky soils the pits require to be deeply excavated to permit of the tap roots of the plant striking perpendicularly down, and even when every precaution is taken, it will be found that estates opened out on poor soils will always prove more expensive than those on forest land, and are not so lasting. The berry produced on rich ferruginous clay is found to contain more aroma and the bean is heavier when compared with those of other localities. This fact is so well known to coffee-brokers generally that, in London a new importation is frequently weighed after being roasted." Some difference of opinion prevails as to the degree of moisture the soil should contain. In *Spon's Encyclopedia* there occurs the following: "The points which determine the value of a plot for coffee culture are—1, elevation, 2, aspect, 3, shelter from winds; 4, shelter from wash, 5, temperature, 6, rainfall, 7, proximity to a river, 8, character and richness of soil. Most of these are necessarily subject to variation according to locality. Shelter from wind is perhaps of paramount importance and should not be sacrificed for richer soil, as the latter can be artificially obtained much quicker than the former. In wooded country the estate may be laid out in blocks of 50 acres, encircled by

Coffee Cultivation—Seed.

COFFEA
arabica.

METHODS.

a general rule virgin forest
up for coffee estates; it has
table matters, and the burning to which it is subjected frees it from insects

holding that moisture is "fatal —but Dr. Shortt remarks, the planter
"must be in the enjoyment of robust health, to be able to withstand the
deadly effects of a damp atmosphere, for, in all probability, he will have
to spend his time surrounded by the direst malaria, &c." Spens, on the
other hand, says:—"The most suitable climate is precisely that which

just quoted from Dr. Shortt's work are much more applicable to Tea than
to Coffee.

Nursery and Seed.—Having selected the site for a plantation, cleared
and burned the trees (taking care, where necessary, to have protecting
belts against prevalent winds), laid out the roads and carried the water-
supply to the coffee-house, it next becomes necessary to select and pre-
pare the spot for a nursery. The soil should have a gentle slope, be
well drained but retentive of moisture, rich and within access of artificial
or natural irrigation. The land should be thoroughly ploughed up or
trenched to a depth of 18 to 24 inches and the weeds entirely exterminated.
Manure at the rate of from 3 to 5 tons an acre should be worked into the
surface soil. The seed-beds may be shaded, but not to the exclusion of
the sun, nor to such an extent as to allow dripping from the protecting
trees. Each bed should be raised to allow drainage, and separated from
the others by narrow paths. If on sloping ground, a deep trench should
be run round the top portion of the nursery so as to divert the surface
water.

The seeds should be sown in rows 6—9 inches apart and about 2 inches
in depth, the seeds being carefully deposited along these lines about 1 inch
apart from each other. They should then be lightly covered with mould and
mats or by branches thrown over the beds. Watering should be done in
the morning or after sunset.

The selection of seed is of great importance. The stock should be
taken from carefully cultivated, healthy, and vigorous plants from 7 to
10 years old and the seed should not be gathered until fully ripe. "A
bushel of seed should give 20,000 to 30,000 plants, the best is parchment
coffee, picked when fully ripe, pulped by hand, unfermented, unwashed,
and dried in the shade" (Spens).

"A bushel will rear 10,000 plants covering 10 acres." (Balfour, *Cyclop
Ind.*) "They should be fully ripe when plucked off the branches, and sown
when fresh, at a depth of 1 inch, and dibbled in the soil in drills 10 to
12 inches apart from each other, so as to give the plantings plenty of room
to grow, and subsequently enable the planter to remove them with facility
from the nursery to the plantation; or the seeds may be sown in drills,

Nursery.
1648Seeds
1649

COFFEA arabica.

Coffee Cultivation—Planting.

METHODS.

and as the seedlings begin to grow the drills should be thinned out to the same distance. The seeds may be even scattered broadcast in the beds, and as they sprout should be thinned out to the regulated distance; care should be taken to let the plantings grow free of each other, which will make them vigorous." (Short)

"When the plants have two to four leaves they should be carefully transplanted, in damp, cloudy weather, from the seed-beds to the nurseries, and placed 9 to 12 inches apart. Care must be taken not to double up the tap-root, and not to leave a space for water to accumulate and rot the roots. If the tap-root is very long, it is best shortened by an oblique cut, when it soon shoots again. When transplanting from the seed-beds to nurseries is not practised, the plants are left in the seed-bed until they have grown larger; but Stalbank and others strongly recommend the former plan, as, by checking the growth, the young wood becomes hardened, and better able, when finally planted out, to resist insects and unfavourable weather. A practical suggestion for preventing young seedlings being eaten off at the surface of the ground by grubs, is to lightly wrap round a piece of paper about 3 inches broad, where the stem joins the root, on planting." (Spont.)

Planting out.
1650

LINING AN
"lined out" is
are in vogue: (. . .
up and down . . .
this line, stake . . .
upon for the po . . .
stretched parallel with the base line and as straight as possible; small . . .
ing poles, and . . .
the fixed ones, . . .
furnished with . . .
bits of scarlet rag at the distance fixed upon between the plants; it is . . .
stretched across the plot and stakes are inserted at each rag; the rope is . . .
it is more labori- . . .
retch of the rope . . .

in their perma-
ected for trans-
plantation, many coffee planters prefer to have two-year old seedlings.
Much difference of o . . .
tion hinges mainly o . . .
nature of the climate . . .
attain any great siz . . .
case under influence . . .
distance adopted varies between 4 and 8 feet each way—7 feet being . . .
very common, or 6 feet between the plants and 7 feet between the rows. . . .
Before the plants are removed . . .
each . . .
If . . .
ing, . . .
ould . . .

be firmly packed around the seedlings so as to prevent water from soaking into the roots.

CULTURAL OPERATIONS.—The further treatment may be briefly reviewed. Weeding, or the removal of all wild plants from the plantation so

Cultural
operations.
1651

Coffee Cultivation—Shade.

COFFEA
arabica.

METHODS.

making, or sup-
 ie enough, and
 degree to which
 nature of the
 s deprived the
 plantation of the natural protection which belts of trees would have
 afforded. According to many planters, however, all trees should be
 removed and shade procured through the cultivation of the charcoal tree
 (*Spondia Wightii*). In two years this forms an ample shade, but as it
 grows older the leaves are shed, so that it requires to be renewed. This is
 easily done, the timber coming in useful. Marshall Ward, in his report
 on the coffee-leaf disease, urges the advantage of belts of trees in helping
 to check the diffusion of the spores of the fungus. "It is a matter for
 regret," he adds, "that such immense unbroken areas of coffee exist with-
 out break of any kind, and one can trace the swaying backwards and
 forwards of the spore-laden winds in consequence." *Draining*.—Nothing
 is more important than a complete system of drains and roads. If the
 operations in this direction have not been completed up to date, the ener-
 gy of the planter during the first two years may be advantageously be-

answer the purpose of refuse pits for the accumulation of manure. Most
 plantations are situated in a form of soil which is not well adapted for the

cultivation than due :
 surface soil, if fully
 the most expensive
 contain lime it becc
 is well-rotted dung,
 be resorted to. Th
 plantation are not always applicable to another, so that no general rule
 can be laid down, and the indications afforded by the soil itself must be
 followed. Most planters urge the necessity of *forking* the soil at least
 once a year. This consists in softening the hard-trodden soil by digging
 it up by means of an iron fork to a depth of 12 to 18 inches.

Pruning.
1652

Sabonadiere "prefers to

C. 1652

COFFEA
arabica.

Coffee Cultivation—Pruning.

METHODS.

postpone the operation till the shrubs have borne their maiden crop, even though extra striking be required to withstand the wind. His plan is to remove the two primaries at the required height, by a sloping outward cut close to the stem, and then to remove the top by an oblique cut, so that the stumps resemble a cross, and a firm natural knot remains to guard against the stem splitting down. Hall (Ceylon) contends that the plants should be topped as soon as they have reached the required height, when the soft wood is easily severed by a pinch between the finger and the thumb. In Natal the shrubs are topped either at their full height—4½ to 5 feet—or at 3 feet, allowing a sucker to grow up on the weather side to complete the height. The latter plan is preferred. There is much advantage gained in limiting the height to 5 feet; not only is the crop gathered more easily and without damage to the tree, but it is actually heavier, and the shrubs are more readily made to cover the ground." (*Span's Encyclop.*, 696.) Dr. Shortt says: "Pruning consists of various operations connected with either arresting the height of the plants to cause them to spread out laterally, or in removing the additional growth of wood, to encourage the plants to push out new fruit-bearing shoots. These various operations come under the different heads of topping, pruning, and handling." With regard to topping he adds: "It is undoubtedly called for on all plantations that lie exposed and are likely to suffer from gales, &c., but in sheltered localities it does

there are
—1st, to
l, second-
latter is

the question turns" The
masses of shoots; these
ng "The first to appear
der the primary boughs:
ing the bark. From the

primaries spring secondary branches, in pairs, and at very short intervals. All such appearing within six inches of the main stem are removed at once, so that a passage of at least a foot is left in the centre of the tree for the admission of air and sun. The object of pruning is to divert the energies of the plant from forming wood and to concentrate them upon forming fruit. The fruit of the coffee tree is borne by young wood, and as the secondaries are reproduced when removed, they are cut off as soon as they have borne, and a constant succession of young wood is thus

effect of the
feet in height
rvals of about
along these

boughs a constant supply of secondary fruit-bearing twigs. All ascending or cross-wise branches or twigs are at once removed, so as to force the plant into the arbitrary and unnatural type of horizontal spreading branches which have the advantage of exposing to the sun and light a large surface from which the crop can with ease be removed. When practicable, the bushes should be handled twice before the crop, and all secondary fruiting twigs pruned off after removal of the crop. The pruning should be finished before the ensuing flowers begin to form, but where this has been neglected, and it is apparent that a flush of so heavy a character as to weaken the plant has set in, it will be necessary to sacrifice

Coffee Cultivation—Season.

COFFEA
arabica.

METHODS.

this by pruning the plant down to the extent it may be expected to fruit without injury. The lateral or primary boughs should not be allowed to grow more than 2½ feet, otherwise they will droop and exclude the light from those below. In pruning, it is often recommended to leave the opposite lateral to that removed, so as to allow of its fruiting next year. By thus cutting the secondaries every other year a continuous crop is secured. All termines should be systematically nipped off, broken, diseased, or dead branches should be cut off.

CATCH-CROPS—Much has been written for and against the growing of other crops along with coffee. In Darjeeling it was tried to grow tea and coffee together, but with little or no success, in spite of the fact that the out door labour and manufacture of these crops so fit into each other that economy might be effected. In Natal and other countries, plantains, even op of and

Catch-crops.
1653

SEASONS FOR COFFEE-PLANTING AND MANUFACTURING OPERATIONS—The industry being chiefly in South India, the seasons for operations very closely correspond with those of Ceylon. The season for commencing agricultural operations is about October, and the buildings require to be finished by January. The best time for firing the felled trees is the beginning of February, the trees having been allowed to dry for about two months. About the same time the land should be lined and

Seasons.
1654

usually rains. The continue every year after. About October every preparation should be complete for the collection of the crop and the manufacture of the berries. The fruits commence to ripen in October or early in November and continue till January. Thus from flowering to harvest occupies about eight months. None but fully ripe berries (technically known as "cherries") should, according to Dr. Shortt, be collected, the women and children going over the plantation periodically to remove all the bright or blood red ones, while carefully leaving the others to mature, once ripe, the sooner collected the better. Mr Pasteur says "The usual course, however, is to pick the cherry before complete maturation, and to allow it to dry on a mat or in a shed."

forked

The preparing or manufacturing of the "cherry" into the "berry" will be found dealt with in a further page

INDIAN AREA UNDER, AND OUTTURN OF, COFFEE.

INDIAN.

The cultivation of coffee is practically confined to Southern India. During the three years 1883, 1884, and 1885 the average area under mature

Area and out-
turn
1655

C. 1655

COFFEE
BAGS

Area of Coffee Cultivation in India.

華僑日報 中華民國二十九年
 十一月二十三日

7. The above results are in good agreement with the results of the other authors, and the results of the present work are in good agreement with the results of the other authors.

[illegible]

There are 12,000,000 in all of the colonies, have been taken from the 1911 Census and put in a pull sheet to the Department of Census and Statistics up to 1930. These figures include the Native tribes of Ceylon, Tanganyika, and Africa and have the only figures greater than the population of the United States and is not a small part of the population of the Department of Census and Agriculture. The 1911 Census is the only one in the world in which the population of the colonies is given in a single column.

1. The first part of the document is a list of names and addresses, including:

 1. The first part of the document is a list of names and addresses, including:

 1. The first part of the document is a list of names and addresses, including:

1. 1990年12月，在北京市召开的“中国新闻奖”评选会议上，
 2. 1991年1月，在北京市召开的“中国新闻奖”评选会议上，
 3. 1991年1月，在北京市召开的“中国新闻奖”评选会议上，
 4. 1991年1月，在北京市召开的“中国新闻奖”评选会议上，
 5. 1991年1月，在北京市召开的“中国新闻奖”评选会议上，
 6. 1991年1月，在北京市召开的“中国新闻奖”评选会议上，
 7. 1991年1月，在北京市召开的“中国新闻奖”评选会议上，
 8. 1991年1月，在北京市召开的“中国新闻奖”评选会议上，
 9. 1991年1月，在北京市召开的“中国新闻奖”评选会议上，
 10. 1991年1月，在北京市召开的“中国新闻奖”评选会议上，

[illegible]

1. 在 1950 年 10 月 1 日以前，
 2. 在 1950 年 10 月 1 日以后，
 3. 在 1950 年 10 月 1 日以后，
 4. 在 1950 年 10 月 1 日以后，
 5. 在 1950 年 10 月 1 日以后，
 6. 在 1950 年 10 月 1 日以后，
 7. 在 1950 年 10 月 1 日以后，
 8. 在 1950 年 10 月 1 日以后，
 9. 在 1950 年 10 月 1 日以后，
 10. 在 1950 年 10 月 1 日以后，

Area of Coffee Cultivation in India.

COFFEA
arabica.

planters
diately t
plants at
forest

AREA AND
OUTTURN.

"The success of Mr. Cannon's experiment led to the occupation of

of estates from the northern slopes of the Babu Budans to the southern limits of Manjarabad, not to mention Coorg and Wynaad beyond "

The above account of the introduction of coffee into Mysore was first published by Colonel Onslow, from whom all subsequent writers have borrowed their information without materially adding to or correcting any one feature of the original statement

Madras Presidency —The following extract taken from pages 290 and 291, Vol I of the Madras Manual published in 1885, gives interesting particulars regarding the cultivation of coffee in the Madras Presidency: "The principal coffee tract of Southern India is along the western coast, and coffee estates extend in nearly an unbroken line along the summits and slopes of the Western Ghats, from the northern limits of Mysore down to Cape Comorin. The only portions of the area within the limits of the Madras Government are the Wynaad tract and the Nilgiri Hills, the rest being in Mysore, Coorg, and Travancore."

MADRAS.
1657

Of the early plantations the Madras Manual adds: "Nearly all the land taken up at this period was what is known as grass or bamboo land, and in consequence most of the estates proved unprofitable. Of many of them not a trace, except the ruins of bungalows, remains at the present day. After the first attempts, coffee cultivation was transferred to South Wynaad. For ten or fifteen years it made little progress. In 1855 and 1856 a number of new estates were opened out, some too hastily, and consequently with little success. In 1862 the return showed 9,932 acres under cultivation. In 1865 there were 200 estates covering 14,613 acres. An official enquiry was made on the subject of Wynaad coffee in the year 1868, and, according to the returns then made, the acreage was 29,909 08, of which 21,479 54 acres were held by Europeans and 8,429 54 acres were held by natives."

South
Wynaad
1658

acres of
of land
per acre
tion (bo
return
on the M
the crops, as very little passes out by Mysore or Coimbatore —

	Cwt.
1856-57	32,658
1857-58	16,204
1858-59	36,034
1859-60	49,080
1860-61	48,742
1861-62	91,080
1862-63	43,907
1863-64	91,947
1864-65	110,548
1865-66	125,891
1866-67	66,552
1867-68	128,011

C. 1658

COFFEA
arabica,

Area of Coffee Cultivation in India.

AREA AND
OUTTURN.

plants was returned at 186,500 acres, and the average yield at 31½ million pounds, which were thus distributed —

	Acres	lb
Mysore	82,100	2,110,000
Madras	55,100	13,160,000
Coorg	42,300	9,330,000
Travancore	4,800	820,000
Cochin	2,200	830,000
TOTAL	186,500	31,250,000

These statistics, which are taken from the Statistical Tables of Finance and Commerce up to the 31st of March 1876, are given in the States of Cochin, Travancore, and Mysore, and hence the area given is greater than that returned (119,142) in the Agricultural Statistics of British India published by the Department of Revenue and Agriculture. The total area taken up for coffee cultivation is 354,331 acres, of which 39,618

are still available in Calcut, to which the crops are conveyed for a considerable distance by water. The Shevaroy Hills are more inland, and cultivation does not seem

to be so extensive as on these hills, the distance from sea being prohibitive. The Shevaroy Hills are more inland, and cultivation does not seem to be so extensive as on these hills, the distance from sea being prohibitive. The Shevaroy Hills are more inland, and cultivation does not seem to be so extensive as on these hills, the distance from sea being prohibitive.

Railways should tend much in their favour. In Mysore, the cultivation is not likely to extend very much, as all the available coffee land has been taken up. The area under mature plants, 81,543

acres, is too great to be cultivated. The area under mature plants, 81,543 acres, is too great to be cultivated. The area under mature plants, 81,543 acres, is too great to be cultivated.

the sheltered tracts

"A northern aspect is best, being moist during the dry season, and possessing the most uniform temperature, but it will be modified either eastwards or westwards according to the locality, so as to suit the prevailing winds. On the western slopes of the coast-ranges, the south-west monsoon bursts with such force that coffee cannot withstand it, in that situation, therefore, an easterly tendency of aspect is imperative. Further inland, the drier and hotter climate will compel a westerly deviation, so as to catch as much as possible of the monsoon rains. In the western or wetter districts, shade is inadmissible; in the eastern or drier districts, it becomes a necessity" (*Spon's Account of the Coffee District of Mysore*)

The following passages regarding the seats of Indian coffee cultivation may be found useful.—

In Mysore the cultivation is limited almost exclusively to the Kadur District. In Vol. II., page 410 of the *Mysore Gazetteer* published in 1876, it is stated that "the coffee cultivation of Southern India may be said to have had its origin in this district, for the plant was first introduced

by a person named Baba Budan, who carried it in his wallet, and, taking it to the hills near

MYSCORE.
1656

Area of Coffee Cultivation in India.

COFFEE
arabica.AREA AND
CULTURE.

forest.

"The success of Mr. Cannon's experiment led to the occupation of

of estates from the northern slopes of the Baba Budans to the southern limits of Manjarabad, not to mention Coorg and Wynaad beyond."

The above account of the introduction of coffee into Mysore was first published by Colonel Onslow, from whom all subsequent writers have borrowed their information without materially adding to or correcting any one feature of the original statement.

Madras Presidency.—The following extract taken from pages 290 and 291, Vol. I. of the Madras Manual, published in 1857, contains particulars regarding the cultivation of coffee in the Madras Presidency.

MADRAS.
1857

"The principal coffee tract of the coast, and coffee estates extend in nearly an unbroken line along the summits and slopes of the Western Ghats, from the northern limits of Mysore down to Cape Comorin. The only portions of the area within the limits of the Madras Government are the Wynaad tract and the Nilgiri Hills, the rest being in Mysore, Coorg, and Travancore."

Of the early plantations the Madras Manual adds: "Nearly all the land taken up at this period was what is known as grass or bamboo land, and in consequence most of the estates proved unprofitable. Of many of them not a trace, except the ruins of bungalows, remains at the present day. After the first attempts, coffee cultivation was transferred to South Wynaad. For ten or fifteen years it made little progress. In 1855 and 1856 a number of new estates were opened out, some too hastily, and consequently with little success. In 1862 the return showed 9,932 acres under cultivation. In 1865 there were 200 estates covering 14,613 acres. An official enquiry was made on the subject of Wynaad coffee in the year 1868, and, according to the returns then made, the acreage was 29,909'08, of which 21,479 54 acres were held by Europeans and 8,429 54 acres were held by natives."

South
Wynaad
1858

acres of mature
of land taken
per acre in the
tion about Rs 2

return. The table below, showing the quantities of Wynaad coffee shipped on the Malabar coast during a period of twelve years, indicates nearly all the crops, as very little passes out by Mysore or Coimbatore:—

	Cwt.
1856-57	32,658
1857-58	16,204
1858-59	36,934
1859-60	49,680
1860-61	48,742
1861-62	91,080
1862-63	43,907
1863-64	91,947
1864-65	110,548
1865-66	125,891
1866-67	66,552
1867-68	125,011

C. 1658

COFFEE
arabica.

Area of Coffee Cultivation in India.

ARFA AND
OUTTURN
Nilghiris
1659

"Coffee cultivation on the Nilghiris was reported on in 1872. A large tract of land on the Nilghiris has proved to be admirably suited for the cultivation of the coffee shrub. Not less than 21,877 acres are now under coffee plantations besides 12,231 acres taken up for planting. Twenty-five years ago the area under coffee did not much exceed 500 acres. This great increase is entirely the result of private enterprise, and has added much to the prosperity of the Nilghiris while at the same time benefiting the districts immediately adjoining. In the establishment of these coffee estates a property has been created worth about 5 millions of rupees. Of the total expenditure, about one third is for the payment of wages to coolies, and most of this is carried into the low country, either in payment for food grains consumed by plantation coolies, or as cash earned by the coolies themselves when they return to their homes. Estimating that the sum sent into the low country in this way represents annually Rs 600,000, this will support about 14,000 families of labouring people. Moreover, in carrying coffee to the coast, and sorting, picking, &c., a large amount of other labour is employed. Until a few years previous to 1850 the coffee plantations on the Nilghiris were found only on the eastern slopes, but they have now been extended to the southern, northern, and north western slopes; there are also some extensive plantations in the Ouchterlony Valley and in the neighbourhood of Coonoor. Coffee cultivation is also carried on on the Shervaray Hills in the Salem District, where nearly 6,000 acres are under. It has been taken up for planting; on the Madurai where nearly 4,400 acres have been taken up for planting, and in the Tinnevely and Coimbatore Districts in the former of which there are about 2,000 acres under coffee and in the latter about 800 acres."

COORG.
1660

In Coorg coffee is also extensively produced, for there are but few

Eu report

of little use in the province and to the Europeans and 4,594 by natives, comprising an area of 77,474 acres or a little

on an assessment

whole area 40,450 are bearing, producing 6125 tons of coffee, or on an average which acre estates

cultivation at the rate per acre assumed above comes to 153 rupees. Of this not less than 60 per cent on an average may be estimated as having been paid to labourers in wages. Calculating that 26,893 labourers, which is about the average number employed throughout the district, of 19 lakhs of rupees were the coffee produced, and on the spot, was

Travancore
1661

former State in 1885 the area under coffee within the past few

Coffee Manufacture.

COFFEA
arabica.AREA AND
OUTPUT.years,
there
but no

the group known as the Anamallays." "The plateaux, by reason of their good climate, rich soil, abundant timber and water-supply, are likely to become better known as the demand for coffee-land increases. One plateau alone (Eroovimullay, or Hamilton's Valley) is 6 miles long by 3 wide, and contains about 10,000 acres of excellent tea and coffee land."

In Cochin there were, in 1883, 17 gardens, and these gave the return of 312½ to the acre at a cost of Rs24.

TECHNICAL TERMS USED BY THE COFFEE PLANTERS.—The ripe coffee fruit is termed the "cherry." The succulent outer coat of the fruit is the "pulp," the inner adhesive layer the "parchment." The seed-coat within the parchment, which adheres closely to the seed, is called "the silver skin." The pulp is usually removed at the plantation, but it is a common practice for planters to send the "berry" or seed enclosed in its parchment to the coast town or even to Europe, in order that by special and expensive appliances it may be deprived of its parchment. This has been strongly recommended within recent years, as the extra cost of transport has been found to be more than compensated for by the better quality of the produce and the great facilities afforded in Europe for working the complicated machinery necessary for this purpose.

COCHIN.
1662Technical
Terms.
1663

PREPARATION OR MANUFACTURE.

MANUFACTURE.

The preparation of the "berry" from the "cherry" may be said to be accomplished in the following stages: (1) *Pulping*; (2) *Fermenting*; (3) *Drying*; (4) *Peeling, Milling, or Hulling*; and (5) *Sizing and Winnowing*.

A volume might be written on the various systems and mechanical appliances that have been or are now employed during the various stages of coffee preparation. The primitive native system is to sun-dry the cherry, then to pound it in the common rice-pounder and winnow away the fragments of the dry pulp and parchment separated from the berry. Besides

of the pulp which surrounds the bean. This is most easily and effectively accomplished if the collections of ripe cherries made each day are passed through the machinery at once. If unavoidably delayed, it may be necessary to ferment the cherries before they can be pulped. The most simple machine in use is that known as the "disc pulper." This consists of rotating discs the surfaces of which are covered with sheet copper roughened by having projections punched forward. A "single pulper" of this description will pulp 20 to 25 bushels an hour and may be worked by three coolies. A "double pulper" of this type has two such discs and is furnished with a feeding roller. It will pulp 40 bushels an hour, and may be worked by from four to six coolies, and double that amount if worked by

Pulping.
1664

C. 1664

COFFEA
arabica.

Area of Coffee Cultivation in India.

AREA AND
OUTTURN
Nilghiris
1659

"Coffee cultivation on the Nilghiris was reported on in 1872. A large area of land on the Nilghiris has proved to be admirably suited for the cultivation of the coffee shrub. Not less than 22,897 acres are now under coffee plantations, besides 12,231 acres taken up for planting. Twenty-five years ago the area under coffee did not much exceed 500 acres. This great increase is entirely the result of private enterprise, and has added much to the prosperity of the Nilghiris, while at the same time benefiting the districts immediately adjoining. In the establishment of these coffee estates a property has been created worth about 5 millions of rupees. Of the total expenditure, about one third is for the payment of wages to coolies and most of the remainder to the country, either in pay as cash carried by the estates. Estimating that the sum sent into the low country in this way represents annually Rs 60,000, this will support about 15,000 families of labouring people. Moreover, in carrying coffee to the coast, and sorting, packing, &c., a large amount of other labour is employed. Until a few years previous to 1850 the coffee plantations on the Nilghiris were found only on the eastern slopes, but they have now been extended to the southern, northern, and north-western slopes, there are also some extensive plantations in the Oucherlony Valley and in the neighbourhood of Coonoor. Coffee cultivation is also carried on on the Shevaroy Hills in the Salem District, where nearly 6,000 acres are under the crop, and an area of 4,680 acres has been taken up for planting, on the Pulney and Shrooomullay Hills in Madura, where nearly 4,400 acres have been planted and a considerable area in the Tinnevely and Combar area about 2,000 acres under

Coorg.
1660

In Coorg coffee is also extensively produced, for there are but few Europeans and natives there who are not interested in its cultivation.

Report of the Government of Coorg. The area under coffee in Coorg is 1,500 acres, of which 1,000 acres are cultivated by Europeans, and 4,594 by natives, comprising an area of 77,474 acres, or a little more than one thirteenth of the area of the whole district.

each estate held by Europeans is 196 acres and by natives 8 acres. Of the whole area 40,350 are bearing, producing 6,125 tons of coffee, or on an average 3 cwt the acre, but the average yield in most European estates, which are much better cultivated than native estates, reaches 7 cwt the acre. Taking the average cost of cultivation at Rs 120 per acre on European estates, and Rs 40 on native, each cwt of coffee costs Rs 27. The cost of cultivation at the rate per acre assumed above comes to nearly 32 lakhs of rupees. Of this Rs 18,093 are paid to the labourers, which is the average received for labour. The cost of coffee on the spot, was

Travancore.
1661

former State in 1885 the area under coffee in Travancore seems to have declined considerably within the past few

Coffee Manufacture.

COFFEA
arabica.AREA AND
CULTURE.

years, or the returns are more nearly correct than they used to be. In 1883 there were said to be 6,268 acres under coffee, with 4,353 acres taken up

the
cul-
7lb.

ays
000

feet with plateaux over 7,000 feet. The more important of these is part of the group known as the Anamallays. "The plateaux, by reason of their good climate, rich soil, abundant timber and water-supply, are likely to become better known as the demand for coffee-land increases. One plateau alone (Eroovimullay, or Hamilton's Valley) is 6 miles long by 3 wide, and contains about 10,000 acres of excellent tea and coffee land."

In Cochin there were, in 1883, 17 gardens, and these gave the return of 312lb to the acre at a cost of Rs 24

TECHNICAL TERMS USED BY THE COFFEE PLANTERS.—The ripe coffee fruit is termed the "cherry." The succulent outer coat of the fruit is the "pulp," the inner adhesive layer the "parchment." The seed-coat within the parchment, which adheres closely to the seed, is called "the silver skin." The pulp is usually removed at the plantation, but it is a common practice for planters to send the "berry" or seed enclosed in its parchment to the

COCHIN.
1662

Technical
Terms.
1663

the great facilities afforded in Europe for working the complicated machinery necessary for this purpose.

PREPARATION OR MANUFACTURE

MANUFACTURE.

The preparation of the "berry" from the "cherry" may be said to be accomplished in the following stages (1) *Pulping*, (2) *Fermenting*, (3) *Drying*, (4) *Peeling, Milling, or Hulling*, and (5) *Sizing and Winnowing*.

A volume might be written on the various systems and mechanical appliances that have been or are now employed during the various stages of coffee preparation. The primitive native system is to sun dry the cherry.

ing of the methods and machinery now in use

PULPING.—The operation known by this name consists in the removal of the pulp which surrounds the bean. This is most easily and effectively accomplished if the collections of ripe cherries made each day are passed through the machinery at once. If unavoidably delayed, it may be necessary to ferment the cherries before they can be pulped. The most simple machine in use is that known as the "disc pulper." This consists of rotating discs the surfaces of which are covered with sheet

Pulping.
1664

COFFEA
arabica.

Coffee Manufacture.

MANUFACTURE.

stream. The discs work against smooth iron beds so adjusted that the complete cherry cannot pass between. They are torn upwards against the beds, and the projections on the discs tear off the pulp, allowing the beans to drop into one receiver and the fragmentary pulp to be carried into another. The disc pulper is in fact somewhat like the cotton gin which drags the fibre forward and drops the seed behind. The "cylinder pulper" is an older invention in its conception, but has been improved and perfected to a much greater extent than the disc, the latter, being light and cheap, is more generally used in new than in well-established plantations. In the construction of a pulping house it is generally recommended to secure a hill side against which an excavation can be made for the house. This should consist of three storeys—a loft in which the cherries are spread out—the pulping floor or platform, and the cisterns. By constructing this building against an embankment or steep cliff, the cherries may be carried direct into the top loft without requiring to be raised. A good supply of water has also to be conveyed to the loft so as to descend with the cherries into the pulping machine in a continuous stream.

edge,
teeth

into the cisterns. By means of sieves the cleaned beans are separated from the partially-pulped cherries, the latter being made to pass once more through the pulper. The stream of water and cherries is carried from the loft of a tube which dips to the bottom of a basin known as the *hopper*. Stones subside in the hopper, while the continuous stream from above causes the hopper to discharge a uniform supply of cherries and water to feed the pulper.

Fermenting
1665

FERMENTING—The parchment coffee, which may or may not have been assorted by contrivances in the pulper and sieves, has now to be fermented to remove from it the saccharine matter. If this be not accomplished it is difficult to dry the beans. By taking advantage of the descending flow of water, the beans are carried into tanks, and these tanks must in their turn be higher than the drying platforms on to which the fermented beans have finally to be dispersed. There are generally four fermenting tanks—two in which the fermentation actually takes place, and two in which the beans are washed. One of each is used for the produce of one day's pulping. All the coffee pulped in one day is allowed to remain in the front or receiving cistern until fermentation has set in. The period necessary for this will depend greatly on the temperature of the atmosphere, but from 12 to 18 hours will generally suffice. The contents of the fermenting vat are then run into the washing cistern, and the receiving vat rendered available for another day's produce. By having two sets of these tanks the pulping operation may be carried out continuously, each day's collection being disposed of so as to have the pulper ready for the next day's work. When properly fermented the beans are easily deprived of their saccharine matter by being driven from the fermenting vat by a goodly supply of water and thoroughly washed in the washing tanks. The size of the fermenting and washing size of the plantation. When possible, the planks being not less than not so cold as stone or brick tanks,

Coffee Manufacture.

COFFEA
arabica.

MANUFACTURE.

Drying
1666

and are accordingly preferred. The tanks should slope towards the discharge openings.

... .. water, be
... .. luences of
... .. concrete,

but sometimes asphalt is employed. A simpler process is to harden the ground and cover it with a coir matting. This has the advantage of admitting of the surplus matting being thrown over the beans in the event of an occasional shower, but shed accommodation into which the beans may be rapidly conveyed is essential. During the drying, the beans have to be turned over repeatedly either by rakes or by the coolies' feet. The difficulties against which the planter has to guard at this stage of the manufacture are too rapid drying cracking the beans, or a disproportioned drying through reckless turning or racking. To secure a better and more steady slow drying, various artificial contrivances have been invented which are now employed by many planters, but the result is the same,—namely, the drying of the beans. Mr. Pasteur says, "On gardens and plantations cultivated by Europeans the cherry is removed as quickly as possible after

going a very
the berries are
many cases, to
to put the fresh

sun the cherry dries quickly, and has then to be pounded to the great detriment of the colour as well as the quality of the bean, hence the difference between *unwashed* or ordinary pale and *washed* or coloured or plantation coffee,—the taste of the *washed* coffee being, as a rule, much more delicate, and free from the earthiness and common rough flavour of the *unwashed*.

PEELING or MILLING—This consists of the removal of the parchment and silver from the beans. As already stated, this operation is now chiefly effected by the dealers, at the port of shipment, and not by the planters. Indeed, much has been written in favour of the beans being sent to Europe in parchment, and milling machinery is now in use in London for this purpose. The following passage from Mr. Pasteur's report will be read with considerable interest, and may be viewed as indicating a possible new direction of coffee enterprise—

"Among the samples of Wynaad coffee, those from the Eva Estate deserve special attention, one half of that crop having been despatched in parchment to be peeled and sized in London. The experiment has proved quite successful, the coffee represented by the sizes, 1st, 2nd, and peaberry, being fully equal in colour and appearance to the corresponding sizes prepared in India. The whole was sold at the same public auction—the

Peeling.
1667

that cured in Central America. These experiments would tend to show that the parchment preserves in a remarkable degree the colour and the quality of the berry against the incidents or accidents of a land and sea transport. In the case of the Costa Rica and New Granada shipments cured in London, the berries seemed fuller and of better shape and weight than the others, as if (which is by no means improbable) the parchment left for two or three months longer than usual around the berries had acted as a kind of natural preserver, inside of which the berry had time, as it were, to mature more completely than when deprived of its outer and inner

COFFEE
arabica.

Coffee Manufacture.

MANUFACTURE.

coating almost immediately after being picked. The curing requires machinery, motive power, drying grounds, delicate manipulation, and constant supervision; where any of those requisites fail, the coffee suffers in appearance, and consequently in value. Suitable machinery for treating parchment has been erected at two of the London wharves, and there is every reason to hope that this is only the beginning of a new and profitable home industry. Growers will not be slow to perceive that the small increase of freight which they have to pay on parchment is more than compensated for by the enhanced price which the improvement in the

The greatest danger in peeling consists in the fact that before being passed through the mill the beans require to be again heated. On the plantation this is generally done by exposure to the sun. The extent to which this is necessary depends greatly on the nature of the beans, and long experience is required to determine this point. As a practical hint it is generally laid down that they should be dried till they resist the pressure of the thumb result in serious

Sizing.
1668

SIZING AND
mill is subjected

drives off the parchment and skin, leaving the clean coffee behind. After this it is separated into various sizes for the market. This has the effect of not only meeting the special demands of the consumers, but in furnishing a bean of uniform size that will admit of uniform roasting. Formerly this used to be done by the hand, but mechanical contrivances are now universally employed.

Packing.
1669

PACKING.—Having followed all the precautions and adopted all the most approved methods and appliances, the coffee producer, to secure the success of his labours, has now only to attend to packing. The beans must be saved from exposure to the air, or from being packed in cases that would impart a false aroma. This is usually done by packing the produce in casks, care being taken to select timber that will not taint the

ADULTERANTS.
1670

ADULTERANTS AND SUBSTITUTES FOR COFFEE

A. A. Variation is never effected by the planter: indeed, it is practically

This in a large measure appears to be due to the legislative action which has permitted a mixture to be sold so long as it is declared to be such. Criminality can be attached to coffee an article that contains anything but roasted chicory root itself y" may be the other vegetable substance applicable for the same purpose as chicory. No questions are therefore raised as to the ingredients of a mixture; and indeed, if necessary, such mixtures may

This fact, together with the with coffee, has given origin

Adulteration of Coffee.

COFFEA
arabica.ADULTER-
ANTS.

to a gigantic system of adulteration. The substances which are most generally employed are—

"1st—Roots such as chicory, dandelion, mangold-wurzel, turnips, parsnips and carrots, &c

"2nd—Seeds such as beans, peas, date-stones, malt, rye, &c

"3rd—Burnt sugar, biscuits, locust-beans, figs, &c" (Bell, *Chemistry of Foods*)

During the proceedings of a Coffee Protection Association formed in London in 1886 the writer had the opportunity of examining certain well-known mixtures and of seeing some of the practices of adulteration. One of the most curious which was brought to his attention was the use of artificially-prepared beans in so close imitation of the real article that the mixture of the spurious with the true coffee beans might be fearlessly ground in the purchasers' presence and sold as *pure coffee*. This subject has already been alluded to under *Chicory* (see *Cichorium Intybus*, C Nos 1107 & 1108), and need not be elaborately dealt with in this place. A largely consumed adulterant of coffee is a substitute for chicory known as *mochara*. This consists of ripe figs dried, roasted, and pulverised. Burnt sugar is sometimes added to coffee in small quantities to give colour to the mixture, and from an idea that it preserves the aroma. Three or four pounds to the hundredweight might be admissible without being viewed as an adulterant. When, however, roasted sugar or a sugar-yielding root (known as *caramel*) is added to a large extent, it becomes a serious adulterant, and perhaps one of the most extensively used of all adulterants. It is to the roasted sugar contained naturally in chicory (*caramel*) that that ingredient owes its bitter flavour and aroma—properties which recommend an admixture of chicory to some consumers as a desirable addition to the beverage. This fact allows of extensive adulteration since the sugar contained in any other root will yield, when roasted, *caramel* bitter. Were saccharine roots the only adulterants employed in coffee, there might be less ground for urging the adoption of the French system which permits the grocer to sell separately chicory or any other substance which the consumer desires to mix with his coffee, but prohibits the vendor from manufacturing special preparations or mixtures. Roasted flour coloured with ferruginous earth is to some extent used as a coffee adulterant, and even roasted liver and other objectionable animal substances are said to have been found in coffee mixtures. A simple mode of detecting the presence of chicory or other *caramel* admixtures in ground coffee is to throw a little on the surface of a glass of clear water. The readily solvent nature of the particles of *caramel* will at once impart coloured streaks to the water, while only after some minutes will pure coffee give its colour to the water.

Caramel

Date seeds were at one time supposed to be likely to come into use as a coffee substitute, and a company was actually formed to carry out this idea, without sufficiently reflecting on the means of procuring and collecting the seeds, supposing even that when roasted and ground they were found to possess in a sufficient degree the flavour and aroma of coffee. The seeds of several species of *Cassia* have for centuries and are even now used by the inhabitants of tropical countries in place of coffee. These do, as a matter of fact, afford when roasted and ground, a decoction which closely resembles coffee. The reader is referred to the account given under *Cassia occidentalis* (C No 784) for particulars of a coffee substitute which would seem to deserve more careful consideration. India could produce at a nominal price as compared to coffee, immense quantities of the so-called "Negro Coffee," if that article should be found to commend itself as a wholesome and cheap substitute for true coffee.

Negro
Coffee.

COFFEE
arabica.

Coffee Manufacture.

MANUFACTURE.

coasting almost immediately after being picked. The curing requires machinery, motive power, drying ground, delicate manipulation, and constant supervision; where any of these requisites fail, the coffee suffers in appearance and consequently in value. A small machine for treating parchment has been erected at two of the London wharves, and there is every reason to hope that this is only the beginning of a new and profitable home industry. Growers will not be slow to perceive that the small increase of freight which they have to pay on parchment is more than made up by the increased price which the improvement in the

... of milling coffee in Europe, instead of at the plantation, are strongly urged. The cost of doing so is stated to be only 25 and 6d per cent (*Report on the C. I. and Ind. Exhibition*, page 169.)

The greatest danger in peeling consists in the fact that before being passed through the mill the beans require to be again heated. On the plantation this is generally done by exposure to the sun. The extent to which this is necessary depends greatly on the nature of the beans, and till they reach the press-
sure of the thumb
result in serious loss.

Sizing
1668

SIZING AND
mill is subjected
drives off the parchment and skin, it will
this it is ... various sizes for the market. This has the effect
of not ... but in furnish-
ing a b ... using formerly
this used to be done by ... trances are now
universally employed.

Packing
1669

PACKING.—Having followed all the precautions and adopted all the most approved methods and appliances, the coffee producer, to secure the success of his labours, has now only to attend to packing. The beans must be saved from exposure to the air, or from being packed in cases that would impart a false aroma. This is usually done by packing the produce in casks, care being taken to select timber that will not taint the coffee. Bags are sometimes employed, but are inferior to casks, and the shipments of coffee should not be made along with cargoes of merchandise likely to injure the coffee.

ADULTERANTS
1670

ADULTERANTS AND SUBSTITUTES FOR COFFEE

Adulteration is never effected by the planter: indeed, it is practically impossible. Until the beans have been ground mechanical impurities such as mud and stones are the only admixtures that may exist in the coffee as it leaves the plantation. While this is so there is perhaps no other dietary article that is so much and so persistently adulterated as coffee. This in a large measure appears to be due to the legislative system which has permitted a mixture to be sold so long as it is declared to be such. Criminality consists alone in selling as pure coffee an article that contains anything but coffee. Legally "chicory" may be the roasted chicory root itself or the root of an allied plant or other vegetable substance applicable for the same purpose as chicory. No questions are therefore raised as to the ingredients of a mixture, and indeed if further protection to the manufacturer be necessary, such mixtures may even be registered as patent medicines. This fact, together with the long established custom of mixing chicory with coffee, has given origin

Adulteration of Coffee.

COFFEA
arabica.ADULTER-
ANTS.

to a gigantic system of adulteration. The substances which are most generally employed are—

"1st—Roots such as chicory, dandelion, mangold-wurzel, turnips, parsnips and carrots, &c

"2nd—Seeds such as beans, peas, date-stones, malt, rye, &c

"3rd—Burnt sugar, biscuits, locust-beans, figs, &c" (*Bell, Chemistry of Foods*)

During the proceedings of a Coffee Protection Association formed in London in 1886 the writer had the opportunity of examining certain well-known mixtures and of seeing some of the practices of adulteration. One of the most curious which was brought to his attention was the use of artificially prepared beans in so close imitation of the real article that the mixture of the spurious with the true coffee beans might be fearlessly ground in the purchasers' presence and sold as *pure coffee*. This subject has already been alluded to under *Chicory* (see *Cichorium Intybus*, C Nos 1107 & 1108), and need not be elaborately dealt with in this place. A largely consumed adulterant of coffee is a substitute for chicory known as *mochara*. This consists of ripe figs dried, roasted, and pulverised. Burnt sugar is sometimes added to coffee in small quantities to give colour to the mixture, and from an idea that it preserves the aroma. Three or four pounds to the hundredweight might be admissible without being viewed as an adulterant. When, however, roasted sugar or a sugar-yielding root (known as *caramel*) is added to a large extent, it becomes a serious adulterant, and perhaps one of the most extensively used of all adulterants. It is to the roasted sugar contained naturally in chicory (*caramel*) that that ingredient owes its bitter flavour and aroma—properties which recommend an admixture of chicory to some consumers as a desirable addition to the beverage. This fact allows of extensive adulteration, since the sugar contained in any other root will yield, when roasted, *caramel* bitter. Were saccharine roots the only adulterants employed in coffee, there might be less ground for urging the adoption of the French system which permits the grocer to sell separately chicory or any other substance which the consumer desires to mix with his coffee, but prohibits the vendor from manufacturing special preparations or mixtures. Roasted flour coloured with ferruginous earth is to some extent used as a coffee adulterant, and even roasted liver and other objectionable animal substances are said to have been found in coffee mixtures. A simple mode of detecting the presence of chicory or other *caramel* admixtures in ground coffee is to throw a little on the surface of a glass of clear water. The readily solvent nature of the particles of *caramel* will at once impart coloured streaks to the water, while only after some minutes will pure coffee give its colour to the water.

Caramel

Date seeds were at one time supposed to be likely to come into use as a coffee substitute, and a company was actually formed to carry out this idea, without sufficiently reflecting on the means of procuring and collecting the seeds, supposing even that when roasted and ground they were found to possess in a sufficient degree the flavour and aroma of coffee. The seeds of several species of *Cassia* have for centuries and are even now used by the inhabitants of tropical countries in place of coffee. These do, as a matter of fact, afford, when roasted and ground, a decoction which closely resembles coffee. The reader is referred to the account given under *Cassia occidentalis* (C No 784) for particulars of a coffee substitute which would seem to deserve more careful consideration. India could produce, at a nominal price as compared to coffee, immense quantities of the so-called "*Negro Coffee*," if that article should be found to commend itself as a wholesome and cheap substitute for true coffee.

Negro
Coffee.

COFFEA
arabica.

TRADE

Trade in Coffee.

two largest co-
coasting trade,
within the pres-
ent and in value Rs 2 lakhs.

During the past five years the
Towards the close of the account given, on a preceding page, of the
History of Coffee, Mr. Pasteur's statement regarding the decline of the
Ceylon trade has been quoted. With the discontinuance of a large portion
of the Ceylon cultivation the greatest hopes were entertained of a bright
future for the Indian coffee industry. Prices revived from 1885 to 1887,
that period the exports to foreign countries maintained a

During the
for 1885-86
his high level
reveal; but
lia is to take
lian foreign
upon this result the decline of the Ceylon industry. It attained its highest recorded
advantage of the decline of the Ceylon industry. It attained its highest recorded
trade in coffee has chronically fluctuated. It attained its highest recorded
point in 1875-76, the exports in that year amounting to 371,600 cwt.; it
fell to 302,500 cwt. in 1876-77, and to 297,300 cwt. in 1877-78. The bulk
of the exports go from Madras (viz. 90 per cent), so that the growth of the
trade since 1867-68 down to the present date may be seen by a comparison
with the Madras exports (given at page 473) from 1856-57 to 1867.

COST OF CULTIVATION AND YIELD.

COST.
1674

that have been advanced are problematic; according to
coffee cultivation in India are problematic; according to
dustry, after passing through an incubation of risk and danger, in which
severe losses have been sustained, is now firmly established. Dr. Shortt
in his useful Hand-book estimates the cost of opening 200 acres of forest
land for the cultivation of coffee, including purchase of land, tools, felling
clearing, lining, holing, planing, road-making, building planter's house
and coolie lines, and keeping the same in order for three years, as
follows:—

	R
1st year	7,160
2nd year	3,300
3rd year	4,400
Instruments	700
Buildings and roads	1,830
TOTAL	17,450

This estimate, he states, is applicable to Coorg and Wynad, more
especially the former, but he only allows Rs 25 a month for European
supervision. He proceeds to state that "the third year is supposed
make a return. The average produce of an acre is estimated at 7 cw
but we could not do better than keep on the safe side and take the pr
duce of an acre at 5 cwt. The 200 acres will yield 1,000 cwt. of coff
beans, and if we take the value of a cwt at Rs 8 (that is giving Rs 7 to 1
maund of 25lb), the return will be Rs 8,000, giving a profit of cent 1
the average expense will not exceed Rs 5,000
pulp machine

Cost of Cultivation

COFFEE
arabica.

COST.

cost of the labour of preparing the beans

The author of the valuable article on coffee-planting in *Spens' Encyclopedia* gives several estimates both for India and for Ceylon. He states: "The following estimate (in rupees) for coffee cultivation in South India is based on the purchase of 300 acres of forest land at Rs 50 and 200 acres grass land at Rs 25, bringing 200 acres of the former into full bearing; labour, 4 annas a day, exclusive of maistries' wages." Then follows a balance sheet, the main facts of which may be expressed as follows:—

The 200 acres by the seventh year are brought under full bearing, and have not only cleared off the expense of the purchase and cultivation of the estate up to date, but the plantation has given its owner over and above Rs 5,971. To continue to work it an expenditure of Rs 2,645 would be entailed, but the return from the crop would be about Rs 4,000 a year, so that with a portion of this the estate might now be extended to its full limits, 300 acres. This estimate has not only been framed to cover the charge of building all the necessary houses, but to furnish those with pulping and other machinery, and to stock the yard with 100 head of cattle and provide a horse for the superintendent. The capital necessary to organise such an estate (without having to obtain loans on crops) would thus be about Rs 75,000, or say £5,000, and during the fifth, sixth, and seventh years that sum would be recovered. Interest on

for. Dr. Smith's statement may be viewed as an indication of what an owner with smaller capital might do by working his own estate. The writer is, however, unable to verify these estimates; but since they have been framed by high authorities, they may be viewed as approximately indicating the possibilities of the Indian coffee industry when, with average seasons and fair prices, the speculation is entrusted to careful and skilful supervision. The hopeful prospect thus presented might, however, prove visionary through causes which not even a just and fair estimate could have taken into consideration. The highest hopes were once entertained of Indian coffee-planting, and yet large sums of money have been lost. It is therefore desirable to place alongside of these estimates, opinions of a very different character. Dr. Bidie says "From ten to twelve years ago (1857-1859), the high price of land, and the flourishing state of coffee culture in Ceylon, induced planters from that island to come over to India, and their presence and efforts gave a great impetus to coffee culture. The

gotten
r hard-
-ambi-
-base of

COFFEA
arabica.

Trade in Coffee.

TRADE.

two largest consumers of Indian coffee. During the past five years the coasting trade which consists chiefly of despatches from Madras to places within the presidency and to Bombay, has averaged in quantity 70,000 cwt. and in value Rs22 lakhs.

Towards the close of the account given, on a preceding page, of the History of Coffee, Mr. Pasteur's statement regarding the decline of the Ceylon trade has been quoted. With the discontinuance of a large portion of the Ceylon cultivation the greatest hopes were entertained of a bright future for the Indian coffee industry. Prices revived from 1885 to 1887, and during that period the exports to foreign countries maintained a higher level than during any previous consecutive period. During the

fell to 302,500 cwt. in 1876-77, and to 297,300 cwt. in 1877-78. The bulk of the exports go from Madras (*viz.*, 90 per cent.), so that the growth of the trade since 1867-68 down to the present date may be seen by a comparison with the Madras exports (given at page 473) from 1856-57 to 1867.

COST OF CULTIVATION AND YIELD.

COST.
1674

So much has been written on this subject that it scarcely falls within the scope of the present article to deal with the various conflicting opinions that have been advanced. According to some writers the profits on coffee cultivation in India are problematic; according to others, the industry, after passing through an incubation of risk and danger, in which severe losses have been sustained, is now firmly established. Dr. Shortt in his useful Hand-book estimates the cost of opening 200 acres of forest land for the cultivation of coffee, including purchase of land, tools, felling, clearing, lining, holing, planing, road making, building planter's house and coolie lines, and keeping the same in order for three years, as follows:—

	R
1st year	2,150
2nd year	3,300
3rd year	4,460
Instruments	700
Buildings and roads	1,830
TOTAL	12,450

This estimate, he states, is applicable to Coorg and Wynand, more especially the former, but he only allows Rs125 a month for European supervision. He proceeds to state that "the third year is supposed to make a return. The average produce of an acre is estimated at 7 cwt., but we could not do better than keep on the safe side and take the produce of an acre at 5 cwt. The 200 acres will yield 1,000 cwt. of coffee beans, and if we take the value of a cwt. at Rs28 (that is giving Rs7 to the maund of 25lb), the return will be Rs18,000, giving a profit of cent per cent. After the third year the average expense will not exceed Rs5,000 on a well-managed plantation, and the profit subsequently will be something fabulous." No allowance is made for the purchase of pulping machinery,

Cost of Cultivation.

COFFEE
arabica.

COST.

the erection of a pulping-house, and other accessories to the preparation of the bean, but Dr. Shortt adds with reference to this that "these will at best form but a small item." But he has omitted apparently to estimate for the purchase of grass and forest land, and to take into consideration the cost of the labour of preparing the beans.

The author of the valuable article on coffee-planting in *Spon's Encyclopedia* gives several estimates both for India and for Ceylon. He states: "The following estimate (in rupees) for coffee cultivation in South India is based on the purchase of 300 acres of forest land at Rs 50 and 200 acres grass land at Rs 25, bringing 500 acres of the former into full bearing; labour, 4 annas a day, exclusive of maistries' wages." Then follows a balance sheet, the main facts of which may be expressed as follows:—

The 200 acres by the seventh year are brought under full bearing, and have not only cleared off the expense of the purchase and cultivation of the estate up to date, but the plantation has given its owner over and above Rs 5,971. To continue to work it an expenditure of Rs 2,645 would be entailed, but the return from the crop would be about Rs 4,000 a year, so that with a portion of this the estate might now be extended to its full limits, 500 acres. This estimate has not only been framed to cover the charge of building all the necessary houses, but to furnish those with pulping and other machinery, and to stock the yard with 100 head of cattle and provide a horse for the superintendent. The capital necessary to organise such an estate (without having to obtain loans on crops) would thus be about Rs 75,000, or say £5,000, and during the fifth, sixth, and seventh years that sum would be recovered. Interest on capital is the only charge on the estate that has been provided for.

framed by high authorities, they may be viewed as approximately indicating the possibilities of the Indian coffee industry when, with average seasons and fair prices, the speculation is entrusted to careful and skillful supervision. The hopeful prospect thus presented might, however, prove visionary through causes which not even a just and fair estimate could have taken into consideration. The highest hopes were once entertained of Indian coffee-planting, and yet large sums of money have been lost. It is therefore desirable to place alongside of these estimates, opinions of a very different character. Dr. Bidie says: "From ten to twelve years ago (1857-1859), the high price of land, and the flourishing state of coffee culture in Ceylon, induced planters from that island to come over to India, and their presence and efforts gave a great impetus to coffee culture. The demand for land rapidly grew in every part of the coffee districts, and as

such contingencies as bad seasons appear to be a serious drawback. Men of moderate means joined in the speculation, and their unwon savings without a doubt as to the success of the speculation established joint stock companies, spent lakhs in the purchase of

COFFEA
arabica

Diseases of the Coffee Plant

PROFITS.

ready, made estates, and pleased their own minds and those of the other shareholders with visions of 50 or 60 per cent of profit. As might have been expected, the anti-ventures have, from various causes, proved complete failures, the balance always being on the wrong side; and, taking them as a whole, the results have been such as to render the public distrustful of coffee culture as a safe or profitable investment, and to lower greatly the value of estates" (*Report on the Ravages of the Borer on Coffee Estates*)

DISEASES.
1675

DISEASES OF THE COFFEE PLANT.

The number of diseases many depending on climate all more or less local, as belong the Canker which believed to be due to want of depth of soil, but climate and bad cultivation may have also to do with it. Rot or the withering of the young leaves is due to wet and cold.

There are, however, certain specific diseases some of which have practically baffled both the planter and the scientists, and have proved so dis-

Cooke, Balfour, &c. To review even briefly all that has been written on the diseases of the coffee plant would take up far more space than can be afforded in the present outline of the coffee industry. It may be said that the specific diseases are referable to two sections—*Fungoid* and *Insectiform*

trix, an organism allied to mould. It attacks the leaves at first yellow, but which ultimately turn black. These spots are eventually extend over the whole

with little success. If powdered sulphur, alone or mixed with caustic lime, be blown over the plants and scattered on the ground below the boughs, the disease is prevented and the coffee plants seem at the same time to be benefited. This is, however, expensive and is more a preventative than a cure. When once the disease has taken hold of the leaves nothing has yet been discovered that will destroy it without at the same time killing the leaves.

(b) *Leaf rot* or *Candelillo* is a disease attributed by Dr. Cooke to the fungus *Pellicularia Koleroga*, Cooke. It is prevalent in Mysore plantations in July, the leaves, flowers, and berries becoming covered with a shiny

COFFEA
arabica.

DISEASES.

11. Of the INSECTIFORM diseases met with in India the following are the most important:—

It has been determined as the beetle *Xylotrechus quadripes*. It is red or yellow, with black in transverse lines. It damages the trees by boring holes into the stem usually a few inches above the ground. These passages are at first transverse, but soon ascend spirally to the growing tip where the larvæ are matured. The plant early shows signs of death, and ultimately withers down to the point where the beetle entered. This pest is most prevalent in hot exposed gardens, and may be kept in check by free irrigation.

(d) *Bugs*—Various insects are by the planters called bugs. They belong to the same family as the lac and cochineal, *viz.* Coccidæ. There are three pests of this nature, known as the "brown," "black," and "white" bugs. The brown bug has been determined as *Lecanium coffeæ*. This establishes itself on the young shoots and buds, which it covers with a scaly incrustation in which the larvæ are developed. This causes the destruction of the parts to which it adheres, the flowers and young fruits falling freely. The pest does not do much harm, however, until it has been two or three years on an estate. It prefers cold damp plantations at about 3,000 feet in altitude. This bug may be first recognised as brownish wart-like bodies. These are the females each of which produces some 700 eggs. Fortunately this pest is freely attacked with parasites which greatly help the planter.

The black bug is known to attach itself to the plant at all altitudes in damp situations. When the eggs

It seems to prefer hot dry plantations and disappears with the rains, only to return in time to destroy the setting of the fruits. It is found on the roots about a foot below the surface of the soil, in the axils of the leaves, and among the clusters of flowers and young fruits. It may be easily recognised by the white excretion formed around the larvae.

All these and the other less known coffee-bugs have a strong dislike to tobacco juice. They may be prevented from developing to an injurious extent by brushing the twigs with tobacco. Some planters recommend saltpetre and quicklime in equal proportions dusted on to the affected parts, or a washing with a preparation of soft soap, tar, tobacco, and spirits of turpentine. Mr. Neltner says that a bug of some kind exists on all estates: "Am I wrong," he asks, "in saying that if there was no bug in Ceylon, it would, at a rough guess, produce 50,000 cwt. of coffee more than it actually does?" Balfour explains the action of the bug as stopping up the pores through which respiration and transpiration take place, thus preparing the way for "the fungus which never fails to attend on the bug." "Mr. Neltner tells us that several means of checking the extension of the bug have been proposed and tried. Amongst these the introduction of the red ant; but their bites are so fierce and painful that the coolies refused to go amongst the trees while the ants were there. Rubbing off the bug

COFFEA
arabica.

Diseases of the Coffee Plant.

DISEASES.

by hand has been tried, but it can only be attempted upon young trees without crop; and Mr Nietner, although allowing that an immense quantity of bug is thus destroyed, is nevertheless of opinion that the effect is but trifling. He thinks that the suggestion, although he results have been rather poor to have the effect on locality, Mr Nietner

reduction in acreage were counterbalanced by a higher system of cultivation universally carried out, the bug would not be so numerous as it now is " (*Balf Cyclop*)

preferring certain parts of the estate but does not confine its ravages to the coffee plant only, as it eats any cultivated plant—vegetable or fruit tree—but despises weeds. It is very destructive to young plants. Mr Nietner states that he lost as much as 25 per cent of his seedlings through this pest. The "White Grub" this includes the larvæ of several species of Melolonthidæ or Cockchafer. These do much damage by eating the roots of the trees. Mr Gordon considers them as one of the greatest enemies to coffee-planting.

(f) *Other Pests*—The *Locust* does of course much injury when present to any great extent but this is more an accidental and occasional than a regular pest. They are not very numerous and drop the berries from the so called JACKAL CO CO

COFFEE-
LEAF TEA
1676

COFFEE-LEAF TEA

It has long been known that coffee leaves, if cured by a process similar to that adopted with tea leaves, afford a beverage which contains sufficient caffeine to entitle it to a position as a cheap substitute for tea or coffee. Indeed according to some writers, the leaves contain more caffeine than the berries. A decoction from the leaves is said to be regularly used by the inhabitants of Sumatra especially at Padang. A Mr John Gardener of London even patented a process for manufacturing and partially roasting the leaves, from the belief that they were likely to come in leaves have an unpleasant

merchandise. But for this fact as compared with tea at 10d for this work by Prof Warden

"Coffee contains about $\frac{1}{2}$ to 2 per cent of a white crystalline principle caffeine, which is similar in composition to the alkaloids, theine, contained in tea. A small quantity of volatile oil is contained in coffee, but during

The Uses of Coffee

COFFEA
arabica.

the roasting of the berries a larger amount is developed, to which the aroma is due. Caffeine appears to act as a stimulant to the nervous system. Coffee leaves have been used as a substitute for the berries: they contain caffeine. Mr N. M. Ward of Padang writes regarding the use of the coffee leaves as follows: "I was induced, several years ago, from an occasional use of the coffee leaf, to adopt it as a daily beverage, and my constant practice has been to take a couple of cups of strong infusion with milk in the evening as a restorative after the business of the day. . . As a beverage the natives universally prefer the leaf to the berry, giving, as a reason, that it contains more of the bitter principle, and is more nutritious." The best mode of roasting is by holding the leaves over a fire made of dry bamboo or other wood which gives little smoke. When sufficiently roasted the leaves have a buff colour; they are ground to a powder and used in the same way as coffee. (Hambury)

COFFEE PULP.

COFFEE
PULP.
1677

It has long been known that the coffee pulp contains an amount of sugar which is sufficient to be fermented into alcohol. At present the washings of the pulp are thrown off and no advantage taken of them. Some persons have urged the planters to utilize the pulp, but no steps have been taken in that direction. It is indeed even questionable whether or not it would pay the planter to divert his attention to a perfectly distinct enterprise. The tendency of the present day is to enable the manufacturer in every branch of industry to compete to the last degree by affording him the means of deriving additional revenue from the waste or by-products of his industry. In this light it seems possible that coffee pulp may come to be put to some useful purpose. It contains much mucilage, with gum and sugar. It is said that in Arabia the pulp is actually employed in the preparation of a pleasant beverage. The pulp is allowed to dry on the fruit and then husked. This husk is

OIL.

OIL
1678

The term "Coffee-oil" is in the trade given to palm-oil in which the kernels have been more or less burnt during the process of extraction. The oil thus obtained possesses the odour of coffee; hence the name. At the same time the roasted beans of coffee possess an essential oil to which indeed they owe their aroma. During the process of roasting a large proportion of this essential oil is given off, and it has often been proposed that the drums employed in coffee-roasting should be connected with an exhaustor so as to condense their oil in a receiver. By this means the aroma might be restored to the coffee or employed to flavour liquors. This empyreumatic oil is formed during the roasting, and probably at the expense of caffeine and other constituents of the coffee (see under Chemistry).

MEDICINE.

MEDICINE
1679

Coffee, while not official in the British Pharmacopoeia, is so in that of the United States of America. Many medical men, however, recommend its use in England for medicinal purposes. Its chief property, as a

COFFEA
arabica.

The Uses of Coffee.

MEDICINE.

stimulant to the nervous and vascular system, is that upon which its claims to medicinal recognition depend. It produces a feeling of buoyancy and exhilaration resembling the first effects of alcohol, but it is not followed by depression and collapse. It increases the frequencies of the pulse, and stimulates the system to throw off feelings of fatigue, or to sustain prolonged and severe muscular exertion. It has even been contended that caffeine has the power of checking the waste of the tissues: Lehmann found that the distilled oil had this effect in quite as strong a degree as tea. The well-established property of coffee in preserving

the nervous system, depression on the nervous excitement increased vigour stupor such as

follows on the use of most other stimulants. Moleschott found that it

cient energy of the brain are manifested without congestion or inflammation. In the case of headache not proceeding from derangements of the acquired musculature.

asthma, and has been recommended in whooping-cough and in hysterical affections. "Hayne informs us that in a case of violent spasmodic disease, pulse so much

... pulse so much
... immediate relief
... antispasmodics

... Dewees it was
... with
... access

cause

characteristic
power in a great
in the primary
it differs in its
of the nervous
efficient as a
quence of the
peculiarly black
who cannot use
stomach. In
t agreeable to
never much it
in a fever, and
rapeutics and

.. of the French Navy reports

the treatment followed by Dr. Guinasso (Quinasso) Johnston's *Chemistry of Common Life* it is stated: "The great use of

Chemical Composition of Coffee

COFFEA
arabica.

MEDICINE.

coffee in France is supposed to have abated the prevalence of gravel in that country. In the French colonies, where coffee is more used than in this country, it is considered a beverage, not

much, but it is the effect of the imposing animal and beneficial application

coffee, burnt in the wards of a hospital early in the morning, is a deodoriser, and a very fragrant one" (*P. Ainsley, Honorary Surgeon, Chicacole, Ganjam, Madras Presidency*) "Is also an antispasmodic, when consumed in large quantities, is supposed by the Arabs to have an anaphrodisiac effect" (*A. S. G. Jayakar, Surgeon-Major, I. M. D., Muskat, Arabia*) "Dried coffee roasted in an open vessel is a useful deoderant" (*Henry David Cook, Surgeon-Major, Calicut, Malabar*). "Is an antidote in opium-poisoning" (*G. A. Watson, Allahabad*)

CHEMISTRY.

CHEMISTRY.
1680

The roasting or torrefying of the coffee-beans, combined with the pulverising they are afterwards subjected to, induces certain changes to which in a large measure the flavour and aroma of the coffee are due. The woody tissue becomes friable, and at the same time certain chemical changes take place. The chief organic constituents of raw coffee are caffeine, fat, caffeic acid, gum, saccharine matter, legumin, and cellulose. Payen gives the following analysis —

Cellular tissue	34 000
Hygroscopic moisture	12 000
Fat	13 000
Starch, sugar, dextrin, and vegetable acids	15 500
Legumin	10 000
Chlorogenate of potash and caffeine	3.5 to 5 000
Nitrogenous matter	3 000
Free caffeine	0 800
Thick insoluble ethereal oil	0 001
Aromatic oil	0 002
Mineral constituents	6 697

Bell (in his *Chemistry of Foods*) gives the following table of the analysis of the 1st Indian coffees, comparing the changes effected by roasting —

Constituents	MOCHA		EAST INDIAN	
	Raw	Roasted	Raw	Roasted
Caffeine	1 08	32	1 11	1 05
Saccharine matter	9 55	43	8 90	41
Caffeic acids	8 46	4 74	9 53	4 52
Alcohol extract, containing nitrogenous and colouring matter	6 90	14 14	4 31	12 67
Fat and oil	12 60	13 59	11 81	13 41
Legumin or albumin	9 87	11 23	11 23	13 13
Dextrin	87	1 24	84	1 38
Cellulose and insoluble colouring matter	37 95	43 62	38 60	47 42
Ash	3 74	4 56	3 69	4 88
Moisture	8 98	0 63	9 64	1 00
	100 00	100 00	100 00	100 00

COFFEA
arabica.

Chemistry of Coffee.

CHEMISTRY.

Should the whole of the testa of the seed (the silver skin of the planters) not have been removed, it separates.

This is known as the roaster's "flights".

removed from the beans before submitting

being roasted the beans swell up and lose from 15 to 20 per cent of their weight. There is perhaps no operation of so much importance as that of roasting.

It should be performed in a covered vessel, over a moderate fire, and the seeds should be kept in constant motion. If mixed sizes are roasted together, the coffee will be much inferior to that obtained by roasting carefully picked and assorted beans. The degree of roasting required for one class of coffee is not the same as that for another. The heat should not be greater than is sufficient to impart a light-brown colour to the bean. When roasting is carried too far, a disagreeable smell and a bitter and acrid taste gradually mingle with the essential aroma, and thus lessen the merit and value of the coffee. By reducing

your are entirely destroyed. When right extent, the volatile oil is re other constituents. A glance at the whole of the saccharine matter or other colour- or other

cane-sugar-yielding roots, as compared with pure coffee. There is something altogether peculiar in the behaviour of the sugar of coffee under the influences of torrefication. How the volatile oil is formed seems to be a puzzle. This oil has been termed Caffeone, and it is the aromatic principle of coffee. It is wholly the product of torrefication, the materials of which it is formed being obtained by the destructive influence of heat on the

which the infusion of tea as a $C_8H_{10}N_2O_2$ is, however, the coffee depends, and it does t is identical with the alkaloid about twice as much theme. On this account a greater

which contain the glutinous matter of tea. Several prosecutions have been

or g
and a England packets of the ground coffee being sold to
old, is far inferior to the continental
g and grinding his own coffee in small
quantities as required.

Structure of the Wood.—Wood white, moderately hard, close-grained. Pores very fine and extremely fine; medullary rays very fine, numerous.

TIMBER.
1681

C. 1681

Liberian Coffee; Job's Tears

COIX
Koenigii.

LIBERIAN COFFEE

LIBERIAN
COFFEE.
1682

This is the *Coffea liberica*, Hiern, a native of Liberia, Angola, &c. several other parts of West Tropical Africa. It is a plant than *C. arabica*, yielding also a more robust and more made known to Europe about the year 1800. Its hardier appearance in Ceylon. Its hardier growth led to the opinion that it might be able to withstand the action of the fungus, and on this account demands poured in to the Royal Botanic Gardens of Kew for plants or seeds to be experimentally tried. Fortunately the Director of the Gardens was fully able to meet these demands until the question of seed-supply was taken up by certain recognised merchants. The Kew Reports are full of the most interesting details regard-

seen Mr. Thomas
the vigorous growth,
scarcely of the Liberian

have toned down considerably, leaving the matter still in an experimental position.

COIX, Linn ; Gen. Pl., III, 112.

"Tears"

COIX gigantea, Koen, Duthie, Fodder Grasses, N Ind, 18; GRAMINEÆ

1683

Vern.—Kesai, BEAR, Danga gurgur, BENG

Reference—Roxb, Fl Ind, Ed C B C, 650

Habitat.—A tall, erect, aquatic grass, with large broad leaves, found in the next species from the central one stalked mountains, but from his in *C. aquatica*, it seems probable that both are referable to one species, if, indeed, they should not be treated as varieties of *C. lachryma*.

It seems probable also that *C. gigantea* and *C. aquatica* are the wild states of the cultivated plant, *C. lachryma*. At all events, no one seems to have observed them under cultivation, and thus, while the grains are not apparently eaten, the other properties of *Coix lachryma* are applicable to the above.

C. Koenigii, Spreng., Duthie, Fodder Grasses, 19.

1684

Syn. for CHIONACHNE BARBATA, R. Br (the COIX BARBATA, Roxb)

C. 1684

COFFEA
arabica.

Chemistry of Coffee.

CHEMISTRY.

Should the whole of the testa of the seed (the silver skin of the planters) not have been removed, it separates during the process of roasting. This is known as the roaster's "flights," or the "fibre;" it should be removed from the beans before submitting these to the grinding mill. On being roasted the beans swell up and lose from 15 to 20 per cent. of their weight. There is perhaps no operation of so much importance as that of roasting. It should be performed in a covered vessel, over a moderate fire, and the seeds should be kept in constant motion. If mixed sizes are roasted together, the coffee will be much inferior to that obtained by roasting carefully picked and assorted beans. The degree of roasting required for one class of coffee is not the same as that for another. The heat should not be greater than is sufficient to impart a light-brown colour to the bean. When roasting is carried too far, a disagreeable smell and a bitter and acrid taste gradually mingle with the essential aroma, and thus lessen the merit and value of the coffee. By reducing

destroyed. When the volatile oil is lost. A glance at the saccharine matter in chicory or other coffee shows the rapid colouring of chicory or other coffee. There is some sugar of coffee under the microscope. It is formed seems to be a the aromatic principle the materials of which

it is formed being obtained by the destructive influence of heat on the other constituents of coffee. Though present only in minute quantities, this empyreumatic oil exercises a powerful influence upon the animal economy. "This activity of the volatile oil of coffee justifying us in con-

about twice as much theine. On this account a greater beverage than of tea. The about 13 per cent. of nutritive matter in the habit of drinking (as thus the full have strongly whether this

in stock pursue the consumer which may be years old, is far inferior to the continental system of the consumer roasting and grinding his own coffee in small quantities as required

Structure of the Wood ~Wood white, moderately hard, close-grained, Pores very fine and extremely fine; medullary rays very fine, numerous.

Liberian Coffee; Job's Tears.

COIX
Koenigii.

LIBERIAN COFFEE.

LIBERIAN
COFFEE.
1682

This is the *Coffea liberica*, *Hiern.*, a native of Liberia, Angola, Gолungo, and Alto, and probably also of several other parts of West Tropical Africa. It is a taller and stronger plant than *C. arabica*, yielding also a larger leaf and berry. It was first made known to Europe about the time the coffee-leaf disease made its appearance in Ceylon. Its hardier growth led to the opinion that it might be able to withstand the action of the fungus, and on this account demands poured in to the Royal Botanic Gardens of Kew for plants or seeds to be experimentally tried. Fortunately the Director of the Gardens was fully able to meet these demands until the question of seed-supply was taken up by certain recognised merchants. The Kew Reports are full of the most interesting details regarding the success which attended the experiments made in almost every part

to cause it to supplant the *Coffea arabica*." The coffee planters of

position.

COIX, *Linn.*; *Gen. Pl.*, III., 112.

A group of grasses belonging to the tribe MAYDEA, and popularly known as "Job's Tears." Under that designation is included not merely the species of *Coix* but of *CHIONACHNE*, and probably also of *POLYTOCA*. The latter are not of such importance as to justify their separation in a work treating purely of economic products, and therefore the popular or rather practical view of these plants will be adopted in the following brief account of the species of "Job's Tears."

Coix gigantea, *Koen.*; *Duthie, Fodder Grasses, N Ind.*, 18; *GRAMINEÆ*

1683

Vern.—*Krsai*, *BEHAR*; *Danga gurgur*, *BENG.*

Reference.—*Roxb., Fl Ind.*, Ed. C. B. C., 50.

Height.—A tall erect grass, 3, found
thru species
by stalked.
Ro. rom his
des seems
probable that both are referable to one species, if, indeed, they should not
be treated as varieties of *C. lachryma*.

It seems probable also that *C. gigantea* and *C. aquatica* are the wild states of the cultivated plant, *C. lachryma*. At all events, no one seems to have observed them under cultivation, and thus, while the grains are not apparently eaten, the other properties of *Coix lachryma* are applicable to the above.

C. Koenigii, *Spreng.*; *Duthie, Fodder Grasses*, 19.

1684

Syn. for *CHIONACHNE BARBATA*, *R. Br.* (the *COIX BARBATA*, *Pers.*)

C. 1684

COIX
lachryma.

Job's Tears.

Kurz in his report on Pegu refers to this plant under the Burmese name of *Kyaip*. It is also known in India, where it bears the following vernacular names: *Gurgur*, BENG.; *Bhut*, *kirma-gilaram gadi*, CHANDA, *Kadpi*, BALAGHAT, C. P.; *Varival*, MAR.; *Ghella gadi*, TEL.

FODDER.
1685

Fodder.—Duthie says that in Balaghât in the Central Provinces, it is said to be used as fodder when in the young state. Roxburgh, however, remarks that, owing to its coarse nature, cattle do not eat the grass.

1686

Coix lachryma, Linn.; *Duthie, Fodder Grasses*, 18.

JOB'S TEARS.

Syn.—C. ARUNDINACEA, Lamk.; LITHAOROSTIS, LACHRYMA JOBI, Gærtn.

Vern.—A recent correspondence between the Government of India and the various provincial Governments has brought to light new and interesting information regarding this plant. It has been shown that *Coix* is much more extensively cultivated than was formerly supposed, and that there exists a very extensive series of wild and cultivated forms of Job's Tears, which the writer has placed under the above species. Should this be proved incorrect, a certain redistribution of the vernacular names, here attributed to the various species of *Coix*, would become necessary. One of the most remarkable of the forms of *Coix lachryma* has been figured in the last part of *Hooker's Icones Plantarum*, Pl. 1764, as *C. lachryma*, var. *stenocarpa*. It is a tall, slender plant, with a single leafy stem, and a few small, white flowers.

347, *Dymock, Mat Med W Ind*, 2nd Ed, 853; *Balfour, Cycl Ind*; *Hooker's Him Jour*, II, 289.

Habitat.—Met with on the plains of India, and on the warm slopes of

C. 1686

Job's Tears.

COIX
lachryma.

tea, and appear to occur at higher altitudes. They are also more stunted in growth, and the involucre (or shell around the grain) is looser, softer, and apparently always furrowed—at least this is so with all the cultivated forms.

THE FORMS OF JOB'S TEARS.—There are three or four well-marked forms of Job's Tears met with in India, which differ from each other in shape, colour, and degree of hardness, and in the presence or absence of grooves or furrows along the length of the hardened involucre. As to shape there are three types—a long cylindrical or tubular (*var. stenocarpa*), the normal form of the wild condition, and a flattened pear-shaped form.

FORMS OF.
1687

regarding these.

1st—The cylindrical form is returned as frequently cultivated, and also wild in the Pegu Divisions of Burma (in the following districts—Prome,

I from no other part of Assam, however, have samples of this form been received, but in the part of *Hooker's Icones Plantarum* (to which reference has been made above) it is stated that "Mr. R. Bruce of Balipara" forwarded samples to the British museum, with a note to the effect that the "Involucres are known to the Assamese and the Mîris, and called by them the *cowmonee* or crow-bead, from the fondness of these birds for this berry." It would appear, therefore, that the cylindrical grain may occur in the Mîri country, but up to date (in connection with the present enquiry) no information corroborative of this fact has been received from Assam, and the plant does not appear to occur in any other part of India, so that it may safely be viewed as a native of Burma, and possibly distributed into the mountain tracts of Upper Assam and Cachar.

food.

2nd—Of the pear-shaped form there are numerous sorts, varying in size and colour—some pale and bluish white; others grey, yellow, or brown-black. They are often constricted at the base into a disk-like annulus, and in all the samples said to be collected from cultivated stock, the grains are more or less deeply furrowed, and in the slate-coloured samples the bottoms of the furrows are of a brown shade. The cultivated forms are also loose-shelled and flattened on one side, somewhat obliquely, like the smaller cardamom. The wild forms are smooth-shelled, the shell being often so thick and hard that it can scarcely be broken. The cultivated

extensive and varied series of cultivated Coix.

3rd—Of the flattened pear-shaped form, all are smooth-shelled and

described above.

COIX
lachryma.

Job's Tears.

FORMS OF.

the shell is from that of from Akyab

roid forms sent from Hanthawaddy some are pink, smooth, and shining, with a natural central perforation, making them look like artificial beads. A brown sample from Akyab is so hard and shining as to closely resemble small marine shells. The Deputy Commis- low marshy land and is not

the means of recording the vernacular will afford reference to the various wild and cultivated plants.

PEGU DIVISION.

BURMA,
Pegu.
1688

five forms exist: a large pear-shaped kind known "and other white, the other brown grey, A brown edible form is cultivated—a polished grain with the characteristic furrows and basal annulus. Lastly, there are two forms of *var stenocarpa*, the one called 'male *cheik*,' long, thin, and 'female *cheik*,' shorter and slightly swollen. These are not given to distinguish the cylindric forms. The best quality is said to come from

the upper valley of the Pegu river.

In Hanthawaddy District some seven or eight forms exist in a wild state or are cultivated

a slaty brown irregular annulus. This is found for 3 annas a basket. A

purely for ornamental purposes. One is a medium-sized steel grey seed, Three are pinkish-brown, small, of the most perfect beads in the whole collection. These have been lettered B D and

Pegu, the sample marked U. C with the "female" form.

In the Frome District both sp. to occur, wild and cultivated. Of

samples furnished that the longer form. The Deputy

is nearly as much swollen as

Job's Tears.

COIX
lachryma.

FORMS OF.

Commissioner deals in his report with a much more extensive series than he has furnished samples of. He says the forms of Coix are known collectively by the name *Kyrikthi*. The cylindrical being *Kyrikthe* (literally, are names to distinguish certain

is *Kyrik*; *Sakrik*, edible *Kyrik*; *n*, or red *Kyrik*

Deputy Commissioner says that all the forms are known by the Burmese name *Kyrikthi*, but that a large round edible form is known to the Karens as *Bé*, and is cultivated, while another smaller round kind is known as the *Be-ma* (or female *Be*) and is collected for ornamental purposes. He further forwards a sample of the cylindrical grain, and says it is known as the *Be-kwa*.

ARAKAN DIVISION.

Arakan.
1689

In the Akyab District the pear-shaped form is both wild and cultivated. From the town of Akyab, the Deputy Commissioner has furnished three samples of the wild plant, the seeds being smooth, polished, and very hard, especially a brown form. He states that these forms grow in the low marshy lands and are not eaten. He, however, furnishes a sample of a cultivated form obtained from Myohung—the largest Coix grain yet examined—which fully supports all that has been stated above. It is steel grey, deeply grooved, with a loose shell and pronounced basal swelling. The Deputy Commissioner describes this as “the cylindrical form,” but while it is certainly longer than the Akyab grain, it is not the cylindrical form (*var. stenocarpa*) described above, but is a monster form of the ordinary cultivated pear-shaped grain.

In the Kyauk-pya District three forms of Coix occur—two wild and one cultivated. The writer has not seen any specimens of these, yet has no reason to doubt but that they would answer very much to the types described under Akyab. One of the wild forms is larger than the other and is known as *jaissee* or *kalinsee*, while the smaller form is the *chitsee*. The edible form is also known as *chitsee*, and is both eaten and made into beer.

TENASSERIM DIVISION.

Tenasserim.
1690

In the Amherst District both the round and cylindrical forms are grown, the former being eaten, and the latter used for ornamenting ladies' dresses. A wild round form is said also to exist. Samples have not been communicated, but the Deputy Commissioner reports that both are known as *kyet*.

In the Shwagun District no form of Coix is known.

In the Taung-ngu District it is stated that the cylindrical form grows wild, while the globular is cultivated, both are known as *kyet*; the former is used for ornamental purposes, and the latter is grown as an article of food and for making beer.

In the Tanu District of the round and the cylindrical forms, the

others are smooth and shining

(1) *Kaleik* is a dark brown or bluish black polished grain of the pear-shaped series.

COIX
lachryma.

Job's Tears.

FORMS OF.

- (2) *Kaleik Kank-nyin*, the same as the last so far as the appearance of the grain goes.
- (3) *Kaleik* ...
- (4) ... grain in ...
ation; i
Deputy
- (5) *Kaleik*
roidal, {
Hanthawaddy sample marked D, but of the same shape. The seeds are less than a 1/2 inch in diameter and not much more than half that size in thickness through the central perforation.
- (6) *Kaleik Yang*, the form of *stenocarpa* that has been described as
- (7) ...

of the steel grey whites are quite as large as No. 7, but few of the straw-coloured ones approach it in size.

In the Salween District both the globular and the cylindrical form is cultivated, but the former exists also in a wild state. They are known in Burmese as *kyet*, the cylindrical being *kyet-tha* and the globular *kyet-thilun*. In the Shan language cylindrical and *Malweleitamun*, the the cylindrical, and *Bowma*, the globular; also in Kachin *Kuise* the cylindrical and *Tabuse* the globular. Both forms are extensively grown in the Shan States, where the cylindrical is sold for R1 a bushel and the globular from 4 to 6 annas.

The following abstract of available information regarding Coix cultivation in Assam may be here given to complete this brief review of the subject:—

ASSAM.
1891

Sir J D Hooker remarks: "A great deal of Coix is cultivated in the Khásia hills; the shell of the cultivated sort is soft, and the kernel is sweet, whereas the wild Coix is so hard that it cannot be broken by the teeth, each plant branches two or three times from the base, and the produce ... Gabe, the Deputy Commissioner of this district cultivate is *Ka-si*, and the varieties

"*Sibu*."—The seed is of a bluish grey colour and pear-shaped in ...
but some-

ndrical in
in being
riction.
set brown
rain, with
ly hard to

admit of its being used for ornamental purposes
"*Sámáprè*"—Pear-shaped in form resembling *Sipia*, but smaller in size. This dark brown regular grain looks at first sight remarkably like some of the forms of black rice. It is about the same size and is pointed at both extremities. It is considerably like an elongated caraway.

Job's Tears

COIX
lachryma.

FORMS OF

"*Kidathá*"—Almost globular in form, of a mottled brown and grey colour. The most marked peculiarity of this grain is that it is dark brown like the *Sipia* form in the lower half and yellow or straw-coloured in the upper.

"*Kasi*"—Globular in form of a light grey or yellow colour. This is the most common variety.

The Naga hill samples, examined by the writer, fully support the opinion formed on examining those from Burma,—namely, that the cultivated races have all a loose easily breakable shell, which is also deeply furrowed. None have smooth polished hard shells like the wild forms which are collected in Burma and other parts of India to be used for ornamental purposes. It may also be added that the average elevation of the Naga and Khasia hills may be put down at from 3 000 to 5 000 feet, whereas the smooth shelled forms are met with chiefly in the marshes of the plains of India and Burma. The white forms of the Khasia hills are harder, more polished, and less furrowed than the cultivated white forms from any other part of India, but they still preserve the characters assigned collectively to the cultivated forms. From the Khasia and Jaintia hills two samples of Coix have been received both of the milky white kind. A large and a small grain from the latter resembles very much the small white grain obtained from Mergut (No 4 above) only that it is a little larger. In the report which accompanies these samples it is stated that four kinds of Coix are grown in these hills, but that "none of the four are wild, all are cultivated exclusively as an article of food. The cylindrical form" (*var stenocarpa*) "is unknown to the Khasias." The dark coloured forms are said to boil softer than the white and the smaller of the two white forms "is slightly better flavoured than the larger."

Naga Hills.

Khasia Hills.

FOOD
1692

Food.—This curious grain might almost be said to be unknown to the natives of India generally, except as a weed of cultivation. To the hill tribes on the eastern frontier, however, it is an important article of food, with the Tankhul Nagas of Manipur it might, indeed, be almost described as the staple article of diet. In several districts of Burma it is also regularly grown as an article of food. Mason says the esculent Coix cultivated by the Red Karens is parched like Indian corn. Of the Bassein district Mr W T Hall (*Director of Land Records and Agriculture*) reports that it is sown in gardens, the crop ripening in November. The produce sells for Rs 10 Rs 3 a bushel. That officer has also forwarded to the writer numerous reports received from the Commissioners of the various Divisions, from which the following account of the method of cultivation may be here reproduced.—"The mode of cultivation is as follows—1st, before the seeds are put in the ground they are tied in a piece of cloth and watered every day for about 7 to 8 days, when whitish roots appear. They are then placed in the ground. In some cases the roots do not appear till 10 or 15 days. 2nd, at the place where the plants are to be grown furrows are formed and the seeds are laid on the earth which is first mixed with cow's dung, afterwards the seeds are covered up with a little earth. Another method is to dig a hole where dung and decayed leaves are burnt and plant the seeds in these places. This method is considered the most successful. When the plants bear fruit and the latter becomes mature or grows white, the branches should be broken off. This will cause the plants to yield another crop and thus to last much longer." Speaking of the cultivation pursued in Akyab the Deputy Commissioner writes (of the Myohaung township) with reference to the form which he calls "the cylindrical," but which, according to the samples discussed above, is a large loose-shelled grain of the pear-shaped series—

COIX
lachryma.

Job's Tears.

FORMS OF.

- (2) *Kaleik Kauk-nyin*, the same as the last so far as the appearance of the grain goes
- (3) *Kaleik* as "ma" alluded to
- (4) *Kaleik* and grain in the Burmese series. It is almost round, with an imbricate glaucous green; is pale, straw-coloured, and pronouncedly furrowed. The flattened spheroid shape is a food grain "smaller than the other shape. The seeds are less than $\frac{1}{4}$ inch in diameter and not much more than half that size in thickness through the central perforation
- (6) *Kaleik Yang*, the form of *stenocarpa* that has been described as "female," a short cylindrical grain with a central swelling
- (7) *Kaleik Kyauk* is a large white or straw-coloured pear-shaped grain devoid of surface furrows. This is the largest straw-coloured grain in the Burmese collection, as No 4 above is the smallest. Many of the steel grey whites are quite as large as No 7, but few of the straw-coloured ones approach it in size

In the Salween District both the globular and the cylindrical form is cultivated, but the former exists also in a wild state. They are known in Burmese as *kyet*, the cylindrical being *kyethishe*, and the globular *kyethihlon*. In the Shan language they are *Milweletayaung* the cylindrical and *Makweletamun*, the globular. In Karen, *Baw-kwa* the cylindrical and *Bowma* the globular, also in Karenni *Kulese* the cylindrical and *Tabuse* the globular. Both forms are extensively grown in the Shan States, where the cylindrical is sold for R1 a bushel and the globular from 4 to 6 annas

The following abstract of available information regarding Coix cultivation in Assam may be here given to complete this brief review of the subject —

ASSAM
1691

Sir J D Hooker remarks "A great deal of Coix is cultivated in the Khasia hills, the shell of the cultivated sort is soft and the kernel is sweet, whereas the wild Coix is so hard that it cannot be broken by the teeth, each plant branches two or three times from the base, and from seven to nine plants grow in each square yard of soil, the produce is small not above 30 to 40 fold" Mr McCabe, the Deputy Commissioner of the Naga Hills, reports "The Nagas of this district cultivate six varieties of Job's Tears. The generic name is *Ka si*, and the varieties are as follows —

1. grey colour and pear shaped in . . . with . . . ome-

2. cal in . . . being . . . t brown . . . in with . . . hard to

admit of its being used for ornamental purposes

"*Sámapre*"—Pear shaped in form resembling *Sipia*, but smaller in size. This dark brown regular grain looks at first sight remarkably like some of the forms of black rice. It is about the same size and is pointed at both extremities. It is considerably like an elongated caraway,

Job's Tears.

COIX
lachryma.

FORMS OF.

“*Kaddhá.*”—Almost globular in form, of a mottled brown and grey colour. The most marked peculiarity of this grain is that it is dark brown like the *Sipia* form in the lower half and yellow or straw-coloured in the upper.

“*Kasi.*”—Globular in form of a light grey or yellow colour. This is the most common variety.”

The Naga hill samples, examined by the writer, fully support the opinion formed on examining those from Burma,—namely, that the cultivated races have all a loose easily breakable shell, which is also deeply furrowed. None have smooth polished hard shells like the wild forms which are collected in Burma and other parts of India to be used for ornamental purposes. It may also be added that the average elevation of the Naga and Khasia hills may be put down at from 3,000 to 5,000 feet, whereas the smooth-shelled forms are met with chiefly in the marshes of the plains of India and Burma. The white forms of the Khasia hills are harder, more polished, and less furrowed than the cultivated white forms from any other part of India, but they still preserve the characters assigned collectively to the cultivated forms. From the Khasia and Jaintia hills two samples of Coix have been received both of the milky white kind. A large and a small grain from the latter resembles very much the small white grain obtained from Mergui (No 4 above), only that it is a little larger. In the report which accompanies these samples it is stated that four kinds of Coix are grown in these hills, but that “none of the four are wild, all are cultivated exclusively as an article of food. The cylindrical form” (*var. stenocarpa*) “is unknown to the Khasias.” The dark coloured forms are said to boil softer than the white and the smaller of the two white forms “is slightly better flavoured than the larger.”

NAGA HILLS.

Khasia Hills.

FOOD
1692

Food.—This curious grain might almost be said to be unknown to the natives of India generally, except as a weed of cultivation. To the hill tribes on the eastern frontier, however, it is an important article of food; with the Tankhul Nagas of Manipur it might, indeed, be almost described as the staple article of diet. In several districts of Burma it is also regularly grown as an article of food. Mason says the excellent Coix cultivated by the Red Karens is parched like Indian corn. Of the Buxsein district Mr. W. T. Hall (*Director of Land Records and Agriculture*) reports that it is sown in gardens, the crop ripening in November. The produce sells for Rs 2 to Rs 3 a bushel. That officer has also forwarded to the writer numerous reports received from the Commissioners of the various Divisions, from which the following account of the method of cultivation may be here reproduced.—“The mode of cultivation is as follows—*1st*, before the seeds are put in the ground they are tied in a piece of cloth and watered every day for about 7 to 10 days, when whitish roots appear. They are then placed in the ground. In some cases the roots do not appear till 10 or 15 days. *2nd*, at the place where the plants are to be grown furrows are formed and the seeds are laid on the earth which is first mixed with cow's dung, afterwards the seeds are covered up with a little earth. Another method is to dig a hole where dung and decayed leaves are burnt and plant the seeds in these places. This method is considered the most successful. When the plants bear fruit a little later becomes mature or grows white, the bean has should be broken off. The small seeds the plants to yield an inferior crop and thus to have much loss.” Speaking of the cultivation pursued in Akshat the Deputy Commissioner writes (of the Makhin district) with reference to the form which he calls “the cultivated” that “the seeds are sown in the same way as usual cereals, the plants are raised and the grain is harvested as usual.”

COIX
lachryma.

Job's Tears.

FORMS OF.

"The cylindrical is sown by the wild hill tribes on Kaing land on the slopes of hills. They do not till the land for this purpose; the seeds are thrown broadcast, and no care is taken of them. In times of scarcity of food the cylindrical are eaten, but now they are only used as ornaments for their dresses." The Deputy Commissioner of Kyaukpya writes regarding a beautiful hard round form which is collected from the wild plant and used for ornamental purposes. Of the cultivated forms he says this is known as *Chitsee*. "It grows in June and July and dies in November and December. The plant is 4 or 5 feet high and like a reed." But a smaller, more delicate, variety is also cultivated, which he remarks is eaten and also used in the manufacture of the small beer known as *Khanag*. He adds "The seed has to be cleaned and has the taste of maize." Of the two kinds grown he says: "The plants, however, differ widely in other respects, and I am unable to say if they belong to the same variety or not."

CHARACTER OF THE EDIBLE GRAIN—On breaking the outer shell, a covey-shaped grain is obtained which, Professor Church says, bears on being cleaned the proportion of 1 to 4 to the total weight of the unhusked article. The Professor gives the following analysis—

Composition of Job's Tears (Husked)

	In 100 parts	In 1 lb
Water	13.2	2 oz 49 grs
Albuminoids	16.7	2 " 434 "
Starch	58.3	9 " 143 "
Oil	5.2	0 " 364 "
Fibre	1.5	0 " 105 "
Ash	2.1	0 " 147 "

"The nutrient-ratio is here 1 : 3.8, the nutrient value 89." From these facts it may be inferred that the grain is not likely to prove of greater economic value in the future than it is at present to the poor hill tribes who are under the necessity of growing this cereal, since, in consequence of their imperfect agricultural system and poor soil, nothing else will grow even so successfully as Coix. Dr. Smith says "it is larger and coarser than pearl barley, but is equally good for making gruel. As it is sold for five pence per Chinese pound, it makes an excellent diet-drink for hospital patients in China." It is worthy of note, however, that from the extensive series of cultivated forms which exist, and the occurrence of a long list of names for the plant and grain in nearly every vernacular language of India and Burma, an indication is given of an ancient cultivation

done in favour of the more wholesome grain. Even the wild plant has so large a grain as to favour the idea of its having been early adopted as a plant to be cultivated. This idea of distribution into India is partly supported by the coincidence of the vernacular names, and may also be accepted as receiving favour from the fact that in the Indo-Burman region the plant is met with largely in a wild state, and at the same time continues to be cultivated and exhibits a greater variety of forms than occur anywhere in India. Coix is said to be cultivated anywhere in India in a kind are grown, but the plant is with in the wild state, while the cylindrical form, but never

Job's Tears.

COIX
lachryma.

FORMS OF.

cultivated. Unfortunately, samples of this wild plant have not been communicated, but Mr. McCabe, from the extensive use to which whom he is living. He describes the words are:—"The cylindrical form is only found in the wild state and is called *sikra*. This plant is never cultivated but is found growing on the edges of terraced cultivation, and in the small gardens in the villages. The leaves resemble closely those of the cultivated species, but the plant is smaller and the stem much tougher. The seed is used, in place of

the beginning of the world rats brought paddy and *sikra* from Japvo Mountain. Man, on seeing these products, took the paddy for himself and left the *sikra* for the rats." Japvo is the highest peak of the Naga system, where neither wild rice nor wild coix occur. The writer does not recollect having ever seen the cylindrical form in the Naga Hills, although he collected numerous samples of the globular; but all under such conditions as to lead him to the opinion that they were cultivated forms or at most only escapes from cultivation.

Medicine.—In some parts of India medicinal properties are assigned to the grain, as, for example, by the Santals, who affirm that "the root is given in strangury, and the menstrual complaint known as *Silla*" (Rev. A. Campbell). Dr. Dymock says the *Kassai-bija* is used as a diuretic.

Domestic Uses.—In many localities the wild, hard, dry, spherical

narrow cylindrical form in embroider-like designs, and the Angami Nagas construct elegant earrings in which a rosette of these seeds surrounds a greenish beetle wing. The various grains which we have in the present article treated of popularly as forms of Coix or Job's tears, seem to stand in good chance of coming into use in Europe in the construction of artificial flowers, laces, bugle-trimmings, and other such purposes for which glass beads are now used, and possibly also in Catholic countries for the manufacture of Rosary beads. If found capable of being dyed a deep black colour, there might be an extensive demand for them, since they would be much more durable than glass. During the late Colonial and Indian Exhibition, several merchants, especially from France, enquired after

MEDICINE.
1693DOMESTIC.
Necklaces.
1694Earrings.
1695Artificial
flowers.
1696
Laces.
1697
Bugle-
trimmings.
1698

Official Colchicum

COLCHICUM
autumnale.

COLCHICUM, Linn., Gen. Pl., III, 821.

Colchicum autumnale, Linn., LILIACEÆ

OFFICIAL COLCHICUM; MEADOW SAFFRON OF AUTUMN CROCUS.

1702

References—*Pharm Ind*, 243, *Fleck & Herb*, *Pharmacog*, 609; *U. S. Dispens*, 15th Ed., 469, 470; *Bentley & Trim*, *Med Pl*, 288, *Dymock*, *Mat Med W Ind*, 835; *Amshel*, *Mat Ind Preface*, xxi; *O Shaughnessy*, *Beng Dispens*, 658, *Year Book of Pharmacy*, 1874, p. 630, *Royle*, *Ill Him Bot*, I, 385, *Spons*, *Encyclop*, 808, *Balfour*, *Cyclop*, *Smith*, *Dic*, 128; *Treasury of Botany*, *Morton*, *Cyclop Agri*, 490.

Habitat.—The plant grows in the meadows throughout Europe. It is an excellent medicine to treat of several species into India. I say that in the Panjab

the fresh colchicum and the seeds of Colchicum are official.

C. sp.

1703

Vern—*Suringán*, *talkh*, *shirin*, *Pb*, *Loabate barbari*, *suringan*, *HIND*, *BOMB*, *BENG*, *TAM*, and *ARAB*, *Aaknak*, *PERS*

Mr. Baden Powell gives this the name of *C. illyricum*, The HERMODACTYL or "FINGER OF HERMES" Dr. Moodeen Sheriff says there are two kinds of the drug—*Suringane-shirin* (sweet *Suringán*) and *Suringane-talkh* (bitter *Suringán*) Dymock speaks of these as the tasteless variety and the bitter, but adds a third form or rather substitute which he says is the sliced bulbs of *Narcissus tazetta*, which are imported from Persia and sold as a bitter *Suringán* The learned authors of the *Pharmacographia* (and also Dr Cooke) are of opinion that the bitter HERMODACTYL is not the produce of a *Colchicum* at all, while Professor Planchon, and following him several other authors, attribute the drug to *Colchicum variegatum*, Linn., a native of the Levant and not known to be found in Kashmir or Persia Planchon in his account of *Suringán* gives a figure of *C. variegatum*, Linn., in the *Bot Mag*, t. 1029

References—*Royle*, *Ill Him Bot*, 385, *Baden Powell*, *Pb Pr*, 381, *Pharmacog*, 609, *U. S. Dispens*, 469, 470, *Bentley & Trim*, *Med Pl*, 288, *Dymock*, *Mat Med W Ind*, 835, *Amshel*, *Mat Ind Preface*, xxi, *O Shaughnessy*, *Beng Dispens*, 658, *Year Book of Pharmacy*, 1874, p. 630, *Royle*, *Ill Him Bot*, I, 385, *Spons*, *Encyclop*, 808, *Balfour*, *Cyclop*, *Smith*, *Dic*, 128, *Treasury of Botany*, *Morton*, *Cyclop Agri*, 490.

Journal, April 1871

Habitat.—The plant from which this medicinal product is obtained is *Dymock*,

the drug is an early Greek, it appears to have been first used medicinally by the Arabs or later Greek physicians; it was first mentioned by Alexander of Tralles, who flourished A.D. 560 (*Libr. M.*) It is deserving of special notice that under the name of *Surugen* or *Hermodactyl*, *Serapion* comprehends the

HISTORY.
1704

COLDENIA
procumbens**The Surinjan, Trailing Coldenia,****HISTORY.**

Nir Muhammad Husain tells us in his *Makhsan* that the white is the best, and that it is not bitter, next the yellow, both may be used internally, the

1.
1.

applied to rheumatic and other swellings, the powdered root is sprinkled on wounds to promote cicatrization. Two kinds of *Surinjan* are met with in Indian shops, bitter and sweet. European physicians in India who inert or nearly

MEDICINE
1705

grains, used in heart disease constipation
Lall, 1st class
Jubbulpore

the latter is officinal and useful in rheumatic affections" (T. N. Ghose, Assistant Surgeon, Meerut)

Colchicum luteum, Baker, according to Aitchison, in a note furnished to the writer, "occurs in early Spring in the Panjáb from Campbellpore, across to Abbottabad the Gullies, at Murree, and in Kashmir extending to Zoja pass

Probably it is the root of this that is *Haran tityn*. But the root of *Merendera Persica*, Bois (Syn. Aitchisonii, Hooker) may be mixed with it

SUBSTITUTES.
1706

SUBSTITUTE OF *SURINJAN*—Dr Dymock says that the sliced bulbs of the true *Narcissus* (*N. tazetta*) which are imported into India from structure very similar to and similar to

COLDENIA, Linn, Gen Pl, II, 841

1707

Coldenia procumbens, Linn, Fl Br Ind, IV, 144, BORAGINÆE

TRAILING COLDENIA

Vern.—*Tripungkh*, *tripunkhi*, *tripungki*, HIND; *Bursha*, SIND; *Tri pakshi*, BOMB; *Seru pad*, *seru-padi*, TAM; *Hamsa padu*, *kama-padi*, TEL; *Tripakshi*, SANS; *Scrappadi*, TAMI in CEYLON

References.—Roxb, Fl Ind, Ed C B C, 150, Voigt, Hort Sub Cal, 445, Thwaites, En Ceylon Pl, 315, Dalt & Gibs, Bomb Fl, 171, Aitchison Cat Pb Pl 93, Ainslie, Mat Ind II, 435, Dymock Mat Med W Ind 2nd Ed, 576, S Arjun, Bomb Drugs, 96, Murray, Pl & Drugs, Sind, 170, Drury, U Pl, 153, Balfour, Cyclop, Treasury of Botany

Habitat.—A small annual weed, usually quite first common throughout tropical India, it generally grows on dry rice fields during the cold season, disappearing about the beginning of the periodical rains. It is common in the hot dry parts of Ceylon. Distributed to Asia, Africa, Australia, and America

C. 1707

Colebrookia ; Country Borage.

COLEUS
aromaticus.

Medicine.—As a medicine, equal parts of the dry PLANT and fennel SEEDS rubbed to a fine powder, and applied warm to boils quickly brings them to suppuration (*Amishe*). The fresh leaves, ground up, are applied to rheumatic swellings (*Murray*).

MEDICINE.
Plants
1708

COLEBROOKIA, Sm ; Gen Pl, II, 1180

A Himalayan genus, comprising only one species, and that one of the commonest and most abundant plants in the Lower Himalaya and mountains of India, ascending to 4,000 feet in altitude

Leaves
1709
1710
1711

Colebrookia oppositifolia, Sm . Fl Br Ind, IV, 642 ; LABIATÆ

Vern—*Pansra*, HINDO, *Shakaradina*, *phisekhar*, *duss*, *sampra*, *sadi*,
in *Flora Indica*, p. 1180.

Root

" common on the lower Himalayas

Mysore It is now viewed as not even worthy of separate recognition as a variety.

Medicine.—The leaves are applied to wounds and bruises (*Stewart*). "The down is used by the Paharias to extract worms from bad sores on the legs (*Gamble*). A preparation from the root is used by the Santals in *Flora Indica*, p. 1180.

MEDICINE.
1712

gra

FODDER
1713
TIMBER
1714

COLESEED or COLLARD, see *Brassica campestris*, Linn, var
Napus, B No 510

COLEUS, Lour, Gen Pl, II, 1176

Coleus aromaticus, Benth, Fl. Br Ind, IV, 625, LABIATÆ

1715

COUNTRY BORAGE

Syn—*C. AMBONICUS*, Lour *Voigt*, Hort Sub Cal, 450; *PLECTRANTHUS AROMATICUS*, Roxb, Fl Ind, Ed C B C, 466

Vern—*Pathor chur*, HIND, *Pâtér chur*, BENO, *Pathor chur*, *pathur chur*, *owa*, BOMB, *Pathur chur*, MAR, *Pashana bhed*, SANS. In *Flora Andrica*, *karpura-valli* is applied to this plant, but Dr. Moodeen Sheriff is of opinion, that the name is more in use for *Anisochilus carnosus*, than any other name

References—*Dals & Gids*, Bomb Fl Supp, 66, Pharm Ind, 168, *Moodeen Sheriff*, Supp Pharm Ind, 114 51, U C Dutt, Mat Med Hind, 313, Dymock, Mat Med W Ind, 505 Drury, U Pl, 153, Lisboa, U Pl Bomb, 163, Royle, Ill Him Bot, I, 303, Balfour, Cyclop

C. 1715

COLDENIA
procumbens.

The Surinjan; Trailing Coldenia.

HISTORY.

Mir Muhammad Husain tells us in his *Makhzan* that the white is the best, and that it is not bitter, next the yellow, both may be used internally; the

in Indian shops, bitter and sweet. European physicians in India who

MEDICINE.
1705

grains, used;
heart disease
constipation,

Lall, 1st class Hospital Assistant, in charge of City Branch Dispensary, Fubbulpore) "Two varieties are found in the bazar—sweet and bitter; the latter is officinal and useful in rheumatic affections" (T. N. Ghose, Assistant-Surgeon, Meerut)

Colchicum luteum, Baker, according to Aitchison, in a note furnished to the writer, "occurs in early Spring in the Panjab from Campbellpore, across to Abbottabad, the Gullies, at Murree, and in Kashmir extending to Zoya pass

Probably it is the root of this that is *Harân-tutiya*. But the root of *Merendera Persica*, Bois (Syn. *Aitchisonii*, *Houker*) may be mixed with it.

SUBSTITUTES.
1706

SUBSTITUTE OF SURINJAN.—Dr. Dymock says that the sliced bulbs of the true *Narcissus* (N. *tazetta*) which are imported into India from Persia as a substitute for *Surinjan* are easily recognisable. He remarks this drug "may be at once detected by its larger size and tunicated structure. The taste is bitter and acrid, the substance amylaceous and very similar to that of the *Hermodactyl*. It is used as an external application, and, according to the author of the *Makhzan*, has properties very similar to those of *surinjan-i-talkh*. Value, annas 3 per lb

COLDENIA, Linn.; Gen Pl., II., 841.

1707

Coldenia procumbens, Linn.; Fl. Br. Ind., IV., 144; BORAGINÆ.

TRAILING COLDENIA.

Vern.—*Tripungkh*, *tripunkhi*, *tripungki*, HIND; *Burska*, SIND; *Tri-pakshi*, BOMB; *Seru-padi*, *suru-padi*, TAM; *Hamsa padu*, *hama-padi*, TEL.; *Tri-pakshi*, SAHS.; *Serappadi*, TAM in CEYLON.

References.—Roxb., Fl. Ind., Ed. C B C, 150; Voigt, Hort. Sub. Cal., 445, Thwaites, Fl. Ceylon Pl., 215; Dals., & Gids., Bomb. Fl., 171; Aitchison, Cal. Ph. Pl., 93; Ainslie, Mat. Ind., II., 435; Dymock, Mat. Med. W. Ind., 2nd Ed., 576; S. Arjun, Bomb. Drugs, 96; Murray, Fl. & Drugs, Sind., 170; Drury, U. Pl., 153; Balfour, Cyclop. & Treasury of Botany

Habitat.—A small annual weed, usually quite flat, common throughout tropical India, it generally grows on dry rice-fields during the cold season, disappearing about the beginning of the periodical rains. It is common in the hot dry parts of Ceylon. Distributed to Asia, Africa, Australia, and America.

C. 1707

Colebrookia, Country Borage

COLEUS
aromaticus

Medicine—As a medicine, equal parts of the dry PLANT and fennel applied warm to boils quickly
The fresh leaves, ground up, are

MEDICINE
Plants
1708

COLEBROOKIA, Sm, Gen Pl, II, 1180

A Himalayan genus comprising only one species and that one of the commonest and most abundant plants in the Lower Himalaya and mountains of India ascending to 4000 feet in altitude

Leaves
1709
1710
1711

Colebrookia oppositifolia, Sm, Fl Br Ind, IV, 642, LABIATÆ

Vern. " " " " " " " " " " " "

applied to Adhatoda Vasica

References—Roxb Fl Ind, Ed C B C, 47 Voigt Hort Sub Cal,

Habitat—A shrub with grey bark common on the outer Himalayas

Nysore It is now viewed as not even worthy of separate recognition as a variety

Medicine.—The leaves are applied to wounds and bruises (Stewart)
"The down is used by the Paharias to extract worms from bad sores on the legs (Gamble) A preparation from the root is used by the Santals in the " " " " " "

MEDICINE.
1712

FODDER
1713
TIMBER
1714

gra

COLESEED or COLLARD, see Brassica campestris, Linn., var Napus, B No 810

COLEUS, Lour; Gen Pl, II, 1176

Coleus aromaticus, Benth, Fl Br Ind, IV, 625, LABIATÆ

1715

COUNTRY BORAGE

Syn.—C AMBOINICUS Lour; Voigt Hort Sub Cal, 450; PLECTRANTHUS AROMATICUS Roxb, Fl Ind, Ed C B C, 47

Vern.—Pāthor chur HINDO Pātīr chur BENG; Pāthor chur pāthor chur, ORISSA; Pāthor chur, MAR; Pāthor chur, SANS
In Flora Andrica karparanta is applied to this plant, but Dr Moodeen Sheriff is of opinion, that the name is more in use for Anisochilus carnosus, than any other name

References.—Das & Gits., Bomb Fl Supp., 67 Pharm Ind., 171; London Sherif Supp Pharm Ind., 171; G. D. 1, Mat Med Ind., 313; Dymock Mat Med W Ind., 505 Drury, U Pl 151; Wilson L Pl Erit., 173, Key, 1, Hym Ex., 1, 33, B. J. 1, Cycl

C. 1715

COLLOCALIA.

Country Borage; Birds' Nests.

MEDICINE.
Plant
1716

Habitat.—A native of the Moluccas, cultivated in gardens throughout India; has a pleasant aromatic odour and pungent taste

Medicine.—The PLANT "is employed in Cochin China, according to
as a
the
treatment of which the expressed juice is prescribed mixed with sugar or
other suitable vehicle. In his own practice he observed it produce so
decidedly an intoxicating effect that the patient, a European lady, who
though

Agri-
ng pro-
perties, and states that the people of Bengal employ it in colic and
dyspepsia" (Phar)
never heard of this
Pharmacopœia of I,
in a
much larger quantity than is usual in Bombay.

Juice
1717

Special Opinions.—§ "Fxy
an anodyne and astringent,
cases of conjunctivitis" (An
Noakhally). "Said by Sans
bladder and to be useful in
(U.
pep

FOOD.
Plant.
1718

orms an agree-
on. Roxburgh
says that "the leaves, and indeed all parts of the plant, are delightfully
fragrant; they are frequently eaten with bread and butter, also bruised
and put into country beer, cool tankards, &c., being an excellent substi-
tute for Borage"

1719

Coleus barbatus, Benth., *Fl. Br. Ind.*, IV., 625; *Wight, Ic.*, t. 1432

Vern.—*Garmal*, BOMB

References.—*Voigt, Hort. Sub. Cal.*, 449; *Thwaites, En. Ceylon Pl.*,
238, *Dals & Gibs, Bomb. Fl.*, 205, *O Shaughnessy, Beng. Dispens.*,
401, *Drury, U. Pl.*, 154, *Lisboa, U. Pl. Bomb.*, 168, *Royle, Ill. Hims.*
Bot., I., 101, 103, *Balfour, Cyclop*

Habitat.—A native of the Peninsula, Gujrat, Behar, and of the sub-
tropical Himalaya, from Kumaon and Nepal, ascending to 8,000 feet.
C
the elevation of 2,000 to 5,000 feet, it is also
whence it was intro-
it grows luxuriantly

FOOD.
1721

ardens of the natives
at Bombay for the roots, which are pickled (J. Graham). (Drury).
Lisboa says that the pickled root is much used by the Gujaratis.

1721

COLLOCALIA.

It would appear that there are two or three species of Swiftlet which form
edible nests. Dr. Jerdon is of opinion that the best nests are obtained from
C
lands, and along the coast of the
Java. Several other species occur
from Archipelago, as far as New
he writ is unable to discover the

C. 1721

COLLOCALIA
nidifica.

Edible Birds' Nests.

NICOBAR
ISLANDS.
1724

is explored, many more nest-yielding caves will be found. All our present knowledge is derived from the Malays, who, through fear of the Andamanese, did not dare to search the interior. The explorations should be confined to hilly country, where the crystalline limestone formation predominates."

NICOBAR ISLANDS.—Mr. deRoepstorff, in his official report of the Nicobar Edible Birds' Nests, remarks: "The best nests I found at Katchall. They were entirely snow-white, and of the best quality. The next best quality I have got were from the Island of Bomboka. This island I . . . , the nests from it "are quite free . . . the same snow-white beautiful . . . nests from Katchall are round and . . . are long, like the section of an orange."

"The third quality I have is from Sambelong. This is white enough, but intermixed with little weeds or granular stalks. These nests are of good quality, . . . I got from it . . . stoff's bluff . . . worthless for . . . mentioned in . . . fastened together by exactly the same glutinous matter which forms the nests first mentioned."

"The Island of Katchall is mostly formed of coral, limestone, and sandstone in all different stages, old, flinty, and yet forming. The island has . . . and some . . . and presents

The light of the sun never shines there. The ground is . . .

side of . . . head . . . white like these, the black

BURMA.
1725

In . . . his particular species occurs abundantly on parts of the coast of the Malayan Peninsula, in the Nicobar Islands, and the Mergui Archipelago, and so high as on . . . of the coast of Aracan, where . . . from all this . . . a, nor does it appear that any other has been observed; and I have examined a multitude both of the adults and of the young taken from the nests, collected in . . . of the same species. . . as far in the . . . nests; and it is . . . ve been hitherto . . . (1807).

"It may be here added that *C. faciphaga* is constantly seen inland in these provinces. The Karens in the valley of the Tenasserim in the latitude of Tavoy are well acquainted with the bird, and they say it crosses the mountains to and from the interior every year. That it is the same species there can be no doubt, for the Karen name of the bird is 'the white swallow,' from its white belly."

C. 1725

Edible Birds' Nests.

COLLOCALIA
nidifica.

In the Burma Gazetteer a list of the birds found in the province is given, and among these are included three species of Collocalia, viz, *C. linnominata*, *Hume*, *C. spodiopygia*, *Peale*, and *C. linchi*, *Horsf*

MALABAR COAST—Very little of a definite nature can be learned regarding the edible swallows' nests collected on the western coast.

MALABAR
COAST.
1726

COLLECTION,
1727

sea-weed which the bird macerates and bruises before it employs the material in layers so much prized a other hand, many gelatinous materi brought up from

food of the swift, viz, insects In support of this opinion they point out that the better qualities of the nests are found in caves far removed from the sea. Some of the nesting caves of Borneo are 140 miles from the sea Mr. deRoepstorff points out that there are no edible nests in the Nicobar settlement, but a few miles off in a richer tract of country where insect life abounds they are plentiful "It is thus," he says, "in places where the food of the swallow is plentiful, that they exist under the most favourable circumstances, and where the nests are best" In the Ratnâgiri District Gazetteer it is stated "the swiftlets breed in March and April, made of inspissated saliva, in the fresh, but when old, brownish

Iceland moss. I have often seen this sea-weed, but have never seen the birds on the sea-shore gathering it Another theory is that the bird excretes this matter from his own throat during the breeding season "

"I am un
have a th
Mr P
pursued i

their nests, all the caves should be visited and the nests collected and brought in. The date of the rain ceases, the number of collectors during the sea.

5th January As the collection takes about a month and the so, the collectors should wait about 10 days in Port Blair, and then go out again, taking care to observe exactly the same order in their rounds. The nests may be col-

C. 1727

COLLOCALIA
nidifica.

Edible Birds' Nests

NICOBAR
ISLANDS
1724

is explored, many more nest-yielding rivers will be found. All our present knowledge is derived from the Malays, who, through fear of the Andamanese, did not dare to search the interior. The explorations should be confined to hilly country, where the crystalline limestone formations predominate."

NICOBAR ISLANDS—Mr deRoepstorff, in his official report of the Nicobar Edible Birds' Nests, remarks "The best nests I found at Katchall. They were entirely snow-white, and of the best quality. The next best quality I have got were from the Island of Bomboka. This island I have not personally visited," but he adds, the nests from it "are quite free from foreign matter, and have not the same snow-white beautiful colour as the ones from Katchall. The nests from Katchall are round and egg-formed, while those from Bomboka are long, like the section of an orange."

"The third quality I have is from Sambelong. This is white enough, but intermixed with little weeds or granular stalks. These nests are of good quality, but need cleaning to separate the stalks. The fourth quality I got from the Car Nicobar from a cave in 'Dryad's Bay' in deRoepstorff's bluff in the north end of this island. These nests were entirely worthless for purposes of trade, consisting of the little weeds which are mentioned in the nests from Sambelong. These nests are, however, fastened together by exactly the same glutinous matter which forms the nests first mentioned."

"The Island of Katchall is mostly formed of coral limestone, and sandstone in all different stages, old, flinty, and yet forming. The island has gone through a series of volcanic revolutions and convulsions, and presents a very pretty landscape, many rents and tearings, ravines and caves extending far under the earth. In these caves dwell the bats and the little swallows. The light of the sun never shines there. The ground is soft to tread on. If you lift it up and inspect it under the torch light it is seen to contain the wings of the insects, that have fallen a prey to the bats, glimmering like a thousand little rubies, the soil is moist, spread it a little and you see the little long-shaped excrements of the swallows together with the feathers fallen from the roosting birds. This is the guano. The swallows' nests are not easily seen but if you lift the torch up to the arched roof by the side of the alabaster-like transparent stalactites white like these, the black head of the little mother appears out of her white little nest."

BURMA
1725

IN BURMA—Mason says of *C. luciphaga* (*C. luchi*) "This particular species occurs abundantly on parts of the coast of the Malayan Peninsula, in the Nicobar Islands and the Mergui Archipelago, and so high as on certain rocky islets off the southern portion of the coast of Aracan, where the nests are annually gathered, and exported to China. From all this range of coast we have seen no other species than *luciphaga*, nor does it appear that any other has been observed, and I have examined a multitude both of the adults and of the young taken from the nests collected in the Nicobars and preserved in spirit, all of which were of the same species. Still, what appears to be *C. nidifica* inhabits the mountains far in the interior of India, though hitherto unobserved upon the coasts, and it is worthy of notice that *C. luciphaga* does not appear to have been hitherto remarked inland in this country" (*Staunton quoted by Mason*).

"It may be here added that *C. luciphaga* is constantly seen inland in these provinces. The Karens in the valley of the Tenasserim in the latitude of Tavoy are well acquainted with the bird, and they say it crosses the mountains to and from the interior every year. That it is the same species there can be no doubt, for the Karen name of the bird is 'the white swallow,' from its white belly."

Edible Birds' Nests.

COLLOCALIA
nidifica,

In the Burma Gazetteer a list of the birds found in the province is given, and among these are included three species of Collocalia, viz, *C. linnomnata*, *Hume*, *C. spodiopygia*, *Peale*, and *C. linchi*, *Horsf*

MALABAR COAST.—Very little of a definite nature can be learned regarding the edible swallows' nests collected on the western coast. They are said to be found in Ratnagiri, North Kanara, and even in Mysore. According to the Gazetteer of the Ratnagiri District the species found on the Vingorla Rock is *C. unicolor*, *Jernon*, No. 103 "The rock on which the nests are found is about four miles long."

MALABAR
COAST.
1726

PECULIARITIES OF THE NESTS AND THE MODE OF COLLECTING THEM—The greatest difference of opinion prevails regarding the nature of the material of which the nests are formed. Early writers used to contend that they were made of a sea weed which the bird collected for the purpose and chemically changed in some mysterious way. *Ure (Arts, Manufactures, and Mines)* says: "The nests are made of a particular species of sea-weed which the bird macerates and bruises before it employs the material in layers so as to form the whitish gelatinous cup-shaped nests so much prized as restoratives and delicacies by the Chinese." On the other hand, many recent writers discredit this theory and believe that the gelatinous material is either the natural saliva of the bird or a substance

COLLECTION,
1727

Nicobar settlement, but a few miles off in a richer tract of country where insect life abounds they are plentiful. "It is thus," he says, "in places where the food of the swallow is plentiful, that they exist under the most

Mr Portman remarks: "The swallow is supposed by some to make this matter, which resembles isinglass, from a species of sea-weed (*fucus*) resembling Carrageen, an Iceland moss. I have often seen this sea-weed, but have never seen the birds on the sea-shore gathering it. Another theory is that the bird excretes this matter from his own throat during the breeding season." I am unable to give any decided opinion in the matter, but the natives

their nests, all the caves should be visited and the nests collected and brought in. The date of this visit, and, indeed, the number of collections during the season, are fixed by the time at which the north-east monsoon rain ceases. Being unusually late this year (1885-86), we did not commence nest-collecting till the end of February, but with a dry December the collection might commence on the 15th January. As the collection of nests from the present known caves takes about a month and the swallows rebuild their nest in six weeks or so, the collectors should wait about 10 days in Port Blair, and then go out again, taking care to observe exactly the same order in their rounds. The nests may be col-

C. 1727

COLOCASIA
antiquorum.

The Kachú or Taro.

floras of the South of Asia, we cannot doubt that this plant is wild in India, as Roxburgh formerly, and Wight and others have more recently, asserted, likewise in Ceylon, Sumatra, and several islands of the Malay Archipelago."

Engler (in *DC., Mono. Phanerogm., vol II*) describes some seven varieties of this plant, three of which are found in India —

a. *typica*; Wight, *lc.*, *Fl. Ind., Ed. C.B.C., 624.* *Chamakúra* TEL.

Of this form Roxburgh describes the *kachú*, the corms of the *ashú kachú*, which

f. 1, cultivated form

2. *nymphæifolia* (*Arum nymphæifolium*, Roxb., *Fl. Ind., Ed. C.B.C., 624.* Wight, *lc.* 1826 *Pl. Ind., Vol. VI.* The *ashú kachú* of Bengal a

Madras; aquatic s

on the borders of lakes and tanks "The root, or rather the subterranean stem, often grows to the length and thickness of a man's arm. The petioles, scape, and leaves, are of a reddish colour, and the plants considerably larger than any of the varieties of *Colocasia*" (*var typica* above), "yet the leaves are narrow in proportion to their breadth" The only good character by which to know this form "is the shortness of the club of the spadix" "Every part of this plant is eaten by the Hindus"

A good deal has been written regarding the cultivated species of *Colocasia*, but it has been found impossible to discover what species, still less which varieties, are alluded to On this account it has been deemed desirable to compile the economic information here given from such authors as could be depended on for the accuracy of their general information, and to thus leave for future research a more detailed description than will be found here.

The following facts seem to refer to *var typica*.

MEDICINE.
1733

Medicine.—The pressed juice of the petioles is styptic, and may be used to arrest arterial hæmorrhage. Dr. Bholanath Bose reports very highly in favour of this property, and states that the wound heals by first intention after its application (*Pharm. Ind.*) It is sometimes used in emache and otorrhœa, and also as an external stimulant and rubefacient by the natives.

Special Opinions.—§ "The juice expressed from the leaf stalks of the black species is used with salt as an absorbent in cases of inflamed glands and buboes. The juice of the corm of this species is used in cases of alopecia Internally, it acts as a laxative, and is used in cases of piles and congestion and other remarkable fresh it than a few hours

FOOD.
1734

where as a weed of damp places The wild condition of the plant is by the Angami Nagas called *Kirih* "The young leaves may be eaten like

C. 1734

The Bish Kachú

COLOCASIA
VIROSA.

spinach, but, like the root, they require to be well cooked in order to destroy the acidity peculiar to Aroids. A considerable number of

FOOD

Atkinson says "The tuber of the cultivated variety is long, white, carrot-shaped, often weighing several pounds, and forms an important article of food among the lower classes, where quantity and not quality is a desideratum. It is usually served fried in ghee or boiled and pounded into a paste, and also in curries hardly weighing more than a q. Coimbatore it is stated that the tubers often weigh as much as 70 to 80 maunds (of 25 lb), worth 12 annas a maund. The tubers are used by the natives of Bombay in curries, &c. They form the common food of the inhabitants of Travancore. The Malays hold it in high estimation (*Balfour*)

§ "Is considered very nutritious by the natives, who use it in their curries" (*Honorary Surgeon P. Kinsley, Chicacole, Madras*)

Colocasia cucullata, Schott

1735

Syn. for *ALOCASIA CUCULLATA*, Schott

C. indica, Engl., DC, *Vono Phanerog.*, II, 494.

1736

Syn. for *ALOCASIA INDICA*, Schott, which see, A 809

This plant is said to be specially cultivated in Brazil for its esculent stems and small pendulous tubers. It is known as *Man sari* in Orissa, and is there used in the treatment of piles.

C. macrorrhiza, Schott

1737

Syn. for *ALOCASIA MACRORRHIZA*, Schott

A species met with in Eastern Bengal and Sylhet, also in Ceylon (the *habarella*). Often cultivated, and the leaves of the very young plant also eaten (*Thwaites, En Ceyl Pl.*, 336). It has been found impossible to obtain definite information as to the extent this plant is cultivated in India, and also as to whether or not it can be viewed as indigenous. DeCandolle, in his *Origin of Cultivated Plants*, refers to it as wild in Otaheiti and in Ceylon. It is known in the former as *apé* and in the Friendly Islands as *kappé*. Ainslie (*Mat Ind.*, II, 463) gives its Chinese name as *dea vew* and the *verruhung kalung* in Tamil, and the *Hastid carnid* (?) in Sanskrit. He remarks "This root in its raw state, like most of the arums,

by the application of heat or by simple drying, the roots become innocuous

C. virosa, Kunth, DC *Mono Phanerog.*, II, 495; *Roxb., Fl Ind.*, Ed C B C, 632 (under *calla*)

1738

Vern.—*Bish Kachú*

This plant, which is a native of the Lower Provinces, is the only member of the genus which the natives of India regard as poisonous. It is sometimes used medicinally, but is never eaten.

C. 1738

COLOCASIA
virosa,

Poisonous Properties of Aroids

CHEMISTRY
1739

Chemistry.—Through the kindness of Messrs Pedler and Warden (*Professors of Chemistry in the Calcutta University*), the writer has had the pleasure to receive an advance copy of their paper* on the chemical properties and medicinal uses of the species which by the early botanists, were all treated as belonging to *ARUM*, but which have since been thrown into some half a dozen genera. The object of the paper was to investigate the *Toxic Properties* of the *Colocasia* and the enquiry was suggested on receiving from the Civil Surgeon of Dibrugarh some portions of raw *Bish Kachhu* tubers and leaves with the following statement: "A cooly woman administered some of the fried *kachhu* to another sick cooly on the same garden, but the man, experiencing a burning sensation in his mouth, instantly spat it out. A pig ate what was so thrown away and died in an hour. A second pig was experimented on with some of the same stuff, and fatal results also supervened." During the course of the same year a second case of poisoning by *kachhu* was referred to the Chemical Examiner's Department, in this case slices of *kachhu* tubers were introduced into a jar containing 'goor'. The symptoms induced in the person into the same, as the symptoms induced in the pig.

A sample of *Colocasia* tubers were forwarded to Dr King for identification, but as a flower had not been furnished he was unable to name the plant further than that it was a species of *Alocasia* or *Colocasia*. Roxburgh and all subsequent writers on economic botany say that the *bish kachhu* is *Colocasia virosa*, and accepting this to have been, in all probability, the plant Pedler and Warden experimented with, their results may be here briefly summarised.—In peeling the tubers "considerable irritation was experienced about the hands, but there was a complete absence of any irritative action on the olfactory organs or conjunctivæ. This fact appeared to us to point towards the non-volatile nature of the active principle." An alcoholic extract was prepared and found to have no poisonous effect. The same result followed on the administration of a distillate which was found to have no acrid taste and as with many other vegetable substances distilled with water, it was found to contain a trace of hydrocyanic acid. "It is possible, however, that certain varieties of *ARUM* may contain a larger amount of prussic acid, as, for example, the *A. seguinum* of the West Indies, which is stated to furnish a juice, two drachms of which has proved fatal in a few hours. The tubers left in the retort after distillation with water were still acrid. The active principle was not destroyed by boiling. *ARUM* for culinary purposes as tamarind. We and ascertained that boiling with water acidulated with hydrochloric acid for a very short period, rendered the tubers quite inert when a fragment was applied to the tongue. Dilute nitric acid also acted in a similar manner. The action of acetic acid on the other hand, was very much feebler, and the acid had to be stronger in order to produce any decided diminution in activity." "A rough analysis of the ash indicated the presence of a large amount of potassium and magnesium, calcium was also present, but we failed to obtain indications of sodium. The acids consisted of carbonic, phosphoric hydrochloric, with traces of sulphuric, acid. We also obtained from the dried tubers very marked quantities of potassic nitrate, so that when they had been incinerated they behaved very like

*See *Jour. Asiat. Soc. Beng.*, LVII, Pt. II, No. 1 for 1883

2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841.

23 Nov 64
12 Dec 64
13 Dec 64
14 Dec 64
15 Dec 64
16 Dec 64
17 Dec 64
18 Dec 64
19 Dec 64
20 Dec 64
21 Dec 64
22 Dec 64
23 Dec 64
24 Dec 64
25 Dec 64
26 Dec 64
27 Dec 64
28 Dec 64
29 Dec 64
30 Dec 64
31 Dec 64
1 Jan 65
2 Jan 65
3 Jan 65
4 Jan 65
5 Jan 65
6 Jan 65
7 Jan 65
8 Jan 65
9 Jan 65
10 Jan 65
11 Jan 65
12 Jan 65
13 Jan 65
14 Jan 65
15 Jan 65
16 Jan 65
17 Jan 65
18 Jan 65
19 Jan 65
20 Jan 65
21 Jan 65
22 Jan 65
23 Jan 65
24 Jan 65
25 Jan 65
26 Jan 65
27 Jan 65
28 Jan 65
29 Jan 65
30 Jan 65
31 Jan 65
1 Feb 65
2 Feb 65
3 Feb 65
4 Feb 65
5 Feb 65
6 Feb 65
7 Feb 65
8 Feb 65
9 Feb 65
10 Feb 65
11 Feb 65
12 Feb 65
13 Feb 65
14 Feb 65
15 Feb 65
16 Feb 65
17 Feb 65
18 Feb 65
19 Feb 65
20 Feb 65
21 Feb 65
22 Feb 65
23 Feb 65
24 Feb 65
25 Feb 65
26 Feb 65
27 Feb 65
28 Feb 65
29 Feb 65
1 Mar 65
2 Mar 65
3 Mar 65
4 Mar 65
5 Mar 65
6 Mar 65
7 Mar 65
8 Mar 65
9 Mar 65
10 Mar 65
11 Mar 65
12 Mar 65
13 Mar 65
14 Mar 65
15 Mar 65
16 Mar 65
17 Mar 65
18 Mar 65
19 Mar 65
20 Mar 65
21 Mar 65
22 Mar 65
23 Mar 65
24 Mar 65
25 Mar 65
26 Mar 65
27 Mar 65
28 Mar 65
29 Mar 65
30 Mar 65
31 Mar 65
1 Apr 65
2 Apr 65
3 Apr 65
4 Apr 65
5 Apr 65
6 Apr 65
7 Apr 65
8 Apr 65
9 Apr 65
10 Apr 65
11 Apr 65
12 Apr 65
13 Apr 65
14 Apr 65
15 Apr 65
16 Apr 65
17 Apr 65
18 Apr 65
19 Apr 65
20 Apr 65
21 Apr 65
22 Apr 65
23 Apr 65
24 Apr 65
25 Apr 65
26 Apr 65
27 Apr 65
28 Apr 65
29 Apr 65
30 Apr 65
1 May 65
2 May 65
3 May 65
4 May 65
5 May 65
6 May 65
7 May 65
8 May 65
9 May 65
10 May 65
11 May 65
12 May 65
13 May 65
14 May 65
15 May 65
16 May 65
17 May 65
18 May 65
19 May 65
20 May 65
21 May 65
22 May 65
23 May 65
24 May 65
25 May 65
26 May 65
27 May 65
28 May 65
29 May 65
30 May 65
31 May 65
1 Jun 65
2 Jun 65
3 Jun 65
4 Jun 65
5 Jun 65
6 Jun 65
7 Jun 65
8 Jun 65
9 Jun 65
10 Jun 65
11 Jun 65
12 Jun 65
13 Jun 65
14 Jun 65
15 Jun 65
16 Jun 65
17 Jun 65
18 Jun 65
19 Jun 65
20 Jun 65
21 Jun 65
22 Jun 65
23 Jun 65
24 Jun 65
25 Jun 65
26 Jun 65
27 Jun 65
28 Jun 65
29 Jun 65
30 Jun 65
1 Jul 65
2 Jul 65
3 Jul 65
4 Jul 65
5 Jul 65
6 Jul 65
7 Jul 65
8 Jul 65
9 Jul 65
10 Jul 65
11 Jul 65
12 Jul 65
13 Jul 65
14 Jul 65
15 Jul 65
16 Jul 65
17 Jul 65
18 Jul 65
19 Jul 65
20 Jul 65
21 Jul 65
22 Jul 65
23 Jul 65
24 Jul 65
25 Jul 65
26 Jul 65
27 Jul 65
28 Jul 65
29 Jul 65
30 Jul 65
31 Jul 65
1 Aug 65
2 Aug 65
3 Aug 65
4 Aug 65
5 Aug 65
6 Aug 65
7 Aug 65
8 Aug 65
9 Aug 65
10 Aug 65
11 Aug 65
12 Aug 65
13 Aug 65
14 Aug 65
15 Aug 65
16 Aug 65
17 Aug 65
18 Aug 65
19 Aug 65
20 Aug 65
21 Aug 65
22 Aug 65
23 Aug 65
24 Aug 65
25 Aug 65
26 Aug 65
27 Aug 65
28 Aug 65
29 Aug 65
30 Aug 65
31 Aug 65
1 Sep 65
2 Sep 65
3 Sep 65
4 Sep 65
5 Sep 65
6 Sep 65
7 Sep 65
8 Sep 65
9 Sep 65
10 Sep 65
11 Sep 65
12 Sep 65
13 Sep 65
14 Sep 65
15 Sep 65
16 Sep 65
17 Sep 65
18 Sep 65
19 Sep 65
20 Sep 65
21 Sep 65
22 Sep 65
23 Sep 65
24 Sep 65
25 Sep 65
26 Sep 65
27 Sep 65
28 Sep 65
29 Sep 65
30 Sep 65
1 Oct 65
2 Oct 65
3 Oct 65
4 Oct 65
5 Oct 65
6 Oct 65
7 Oct 65
8 Oct 65
9 Oct 65
10 Oct 65
11 Oct 65
12 Oct 65
13 Oct 65
14 Oct 65
15 Oct 65
16 Oct 65
17 Oct 65
18 Oct 65
19 Oct 65
20 Oct 65
21 Oct 65
22 Oct 65
23 Oct 65
24 Oct 65
25 Oct 65
26 Oct 65
27 Oct 65
28 Oct 65
29 Oct 65
30 Oct 65
31 Oct 65
1 Nov 65
2 Nov 65
3 Nov 65
4 Nov 65
5 Nov 65
6 Nov 65
7 Nov 65
8 Nov 65
9 Nov 65
10 Nov 65
11 Nov 65
12 Nov 65
13 Nov 65
14 Nov 65
15 Nov 65
16 Nov 65
17 Nov 65
18 Nov 65
19 Nov 65
20 Nov 65
21 Nov 65
22 Nov 65
23 Nov 65
24 Nov 65
25 Nov 65
26 Nov 65
27 Nov 65
28 Nov 65
29 Nov 65
30 Nov 65
1 Dec 65
2 Dec 65
3 Dec 65
4 Dec 65
5 Dec 65
6 Dec 65
7 Dec 65
8 Dec 65
9 Dec 65
10 Dec 65
11 Dec 65
12 Dec 65
13 Dec 65
14 Dec 65
15 Dec 65
16 Dec 65
17 Dec 65
18 Dec 65
19 Dec 65
20 Dec 65
21 Dec 65
22 Dec 65
23 Dec 65
24 Dec 65
25 Dec 65
26 Dec 65
27 Dec 65
28 Dec 65
29 Dec 65
30 Dec 65
31 Dec 65

17

FOR
LEA ST
1 47
S A 43
1-10
FARMER
1751

COMBRETUM
ovalifolium.

Bladder Senna

COLUTEA, Linn, Gen Pl, I, 505.

[103, LEGUMINOSÆ.

1740 Colutea arborescens, Linn, var. nepalensis; Fl Br Ind, II,

THE BLADDER SENNA, NEPAL BLADDER SENNA.

Syn — C NEPALENSIS, Sims, Bot Mag, t 2622

VERN — Brda, LADAK, AFOHANISTAN

References — Brandis, For Fl, 135 Gamble, Man Timb, 118, Stewart, Pb Pl, 64, O'Shaughnessy, Beng Dispens, 294; Fluck and Hanb, Pharmacog, 221, U S Dispens, 15th Ed, 1298 1617 Murray, Pl and Drugs, Sind, 131, Royle, Ill Him Bot, I, 195, 198, Treasury of Botany

Habitat — A shrub of the temperate west Himalaya, Kunawar, Tibet, Nipal, &c, at an altitude of 8 000 to 11 000 feet

MEDICINE
Leaves
1741

Medicine — The leaves of this plant are purgative, and are used to adulterate official senna, and in some parts of Europe as a substitute for senna, though comparatively feeble in their action They are administered in infusion or decoction in the dose of about half a pint (U. S Dispens, 1617)

Colza Oil, see Brassica campestris, Linn, var Napus, B No 810

COMBRETUM, Linn, Gen Pl I, 688

[COMBRETACEÆ

1742 Combretum decandrum, Roxb, Fl Br Ind, II, 452,

VERN — Dhobela, CHINDWARA, Punk, GONDA, OUDH, Arikola, TEL, Kala la, NEPAL, Pindik, LETCHA

References — Roxb, Fl Ind, Ed C B C, Brandis, For Fl, 221, Gamble, List of Darjeeling Climbers, &c

Habitat — Abundant in Bengal at altitudes up to 3 000 feet Very common in the North Deccan plateau, in the North Western Provinces, Tenasserim, and the Andamans

Is said to be used medicinally, but very little is known regarding the uses of the plant The Santals, who call it *atenu*, make baskets from its long thin stems (Campbell)

1743

C. nanum, Ham, Fl Br Ind, II, 457

VERN — Dant jathi, pharsia, N W P and Pb

References — Brandis, For Fl, 221; Baden Powell, Pb Pr, 350; Royle, Ill Him Bot, I, 209

Habitat — A decumbent, low shrub of the Himalayan terai, from Sikkim to the Panjab

Medicine — Mr Baden Powell mentions this plant among his medicinal plants of the Panjab

MEDICINE.
1745

1746

C. ovalifolium, Roxb

VERN — Bandi kattu fige, yadala chettu, bandi kola, TEL (the buffalo-call tree)

A common climber throughout the Deccan Peninsula, probably eaten by buffalos

C. 1746

The Spider-works

COMMELINA
communis.

COMBS, fans, brush backs, and other smaller articles—Woods used for —

Adina cordifolia (combs)
Alangium Lamarckii (cattle bells)
Albizia stipulata (cattle bells)
Artocarpus integrifolia (brush-backs)
Bauhinia Vahlii (umbrellas, rain-caps)
Buxus sempervirens (instruments, combs, small boxes)
Carissa diffusa (combs)
Casuarina tomentosa (combs)
Chloroxylon Swietenia (picture-frames, brush backs)
Cordia Macleodii (picture frames)
Cordia nepalensis (small articles)
Corypha umbraculifera (fans, umbrellas)

Crataeva religiosa (combs)
Elmoeodron glaucum (combs, picture-frames)
Gardenia costata (combs)
G. latifolia (combs)
G. lucida (combs)
Gmelina arborea (picture frames)
Olea ferruginea (combs)
Platanus orientalis (pen cases)
Psidium Guava (instruments)
Pyrus Pashia (combs, tobacco-pipes)
Schreberia swietenoides (combs and weavers' beams)
Stephegyne parvifolia (combs)
Sterculia urens (guitars)

WOODS FOR
COMBS, &c.
1747

COMMELINA, Linn, Gen Pl, III, 847

1747

Commelin.
9, Clarke,
MELINACEÆ

1748

Vern — *aka, kashira kshradam, iura, kanna, Pa, khanna, or diya mendirya, Sino;*

References — *Roxb, Fl Ind Ed CBC 57 Voigt, Hort Sub Cal, 676, Thwaites En Ceylon Pl 321, Dals & Gills Bomb Fl, 253, Stewart Pb Pl, 235 Aitchison Cat Pb and Sand Pl 148, Trimen Syst Cat, 95 DeCandolle, Mono Phanerogam, III, 159 Rev A Campbell, Descript Cat of the Pl Chutia Nagpur, U C Dutt, Mat Med Hind, 303, Murray Pl and Drugs, Sind, 22*

Habitat — A native of wet places all over Bengal (*Roxb*) It also occurs in the peninsula of India generally, and in Sind, Salt Range, and the Deccan Dalzell and Gibson say that it is common everywhere in Bombay Distributed to Burma, Malay, and China

Food — LEAVES eaten by the poor people as a pot herb especially in times of scarcity The fleshy rhizomes of some of the species of this genus contain much starch, mixed with mucilage, and are therefore wholesome food when cooked Balfour says *C. polygama* (a name which would appear to be a synonym for *C. benghalensis*) is cultivated in China as a pot herb eaten in spring "The juice of the flower is used as a bluish pigment in painting upon transparencies" (*Smith*)

FOOD
Leaves
1749.
Starch
1750
Pigment.
1751

C. communis, Linn, DC, Mono Phanerogam, III, 170

1752

Vern — *Kena BOMB, Wek kyaq BURM* Stewart says that this, as also *C. benghalensis* are in the Panjab known as *Chura kanna* Balfour gives the following names *Kanang kirai, kunnai kalli pilu TAM, Venna devi kura niru kassavu, venna mudra, venna vedara TEL, Vatsa priam SANS*

It may be here recorded of the vernacular names given to this and in fact, to all the species of *Commelina* that they require to be verified and assorted under the modern scientific names for the species of this genus

COMMELINA
suffruticosa.

The Spider wort

References.—*Vergl. Hort. Sub. Cul.*, 1771; *Dalr. & Gibb.*, *Bomb. Fl.*, 1817; *Stewart.*, *Fl. Fl.*, 1817; *Adichurn.*, *Cat. Fl.*, 1818 and *Sin* 111, 149; *Dalfour's* *Cult. Garden of India*.

Habitat.—A native of the hot damp regions of China and Japan. From Chittapong, plants are said to have been sent to the Botanic Gardens, Calcutta. But it is feared a good deal of the root.

The information that could not be established as referable to either of these plants has for the

FOOD.
Seeds.

1753

LEAF.

1754

ways the succulent leaves are used by the Hindus for feeding young calves when they wish to wean them from their milk. "The leaves are eaten by the natives mixed with other greens."

1755

[*Com. and Girl. Table I.*
Commelina nudiflora, Linn.; *DC. Mono.*, III., 144; *C. B. Clarke's*
Syn.—*C. coccinea*, Roxb., *Fl. Ind.*, Ed. C. B. C., 57; *C. nudiflora*,
 Linn., as described in *Roxb.*, *Fl. Ind.*, Ed. C. B. C., in *ANILEMA NUCI-*
FLORUM, Linn., the *Kundali* of Bengal.

Habitat.—Frequent in Bengal, and distributed to Burma, Ceylon, and the Malay, also to Africa, Madagascar, Mauritius, Sandwich Islands, and Australia, &c.

Compare this with the remarks under *C. communis*, Linn., and *C. obliqua*, Lam.

1756

C. obliqua, Lam.; *Clarke*, p. 19, pl. IX.

Syn.—*C. communis*, Roxb., *Fl. Ind.*, Ed. C. B. C., 57.

Vern.—*Kanjura*, *kana*, HIND.; *Jata-kanchura*, *jata-kanshira*, BENG.; *Korna*, *kana*, BIJAPUR; *Kanjura*, KUMAON.

Habitat.—This species is common over the low moist parts of India, flowering during the rainy season chiefly. It also occurs on the lower

MEDICINE.

Root.

1757

FOOD.

Root.

1758

1759

C. salicifolia, Roxb.; *Fl. Ind.*, Ed. C. B. C., p. 58.

Vern.—*Yalapipari*, *langull*, SANS.; *Pani-kanchira*, BENG.; *Yalipari*,
 HIND.; *Bir kana arak*, SANTAL.

References.—*DeCandolle*, *Mono. Phanerog.*, III., 157; *U. C. Dutt*, *Mat. Med. Hind.*, 300.

Habitat.—Common in wet places in the peninsula of India, especially in Bengal, Coromandel, and Bombay. Distributed to Burma.

Fodder.—Cattle are said to be fond of this plant.

FODDER.

1760

1761

C. scapiflora, Roxb.; see *Anellema scapiflorum*, Wight.: A 1122.

C. suffruticosa, BI; *DC.*, *Mono. Phanerog.*, III., 188.

Vern.—*Dare orsa*, SANTAL.

Habitat.—A native of Bengal.

Medicine.—The root is by the Santals applied to sores (*Campbell*).

MEDICINE.

Root.

1762

C. 1762

Spotted Hemlock, Connarus

CONNARUS
monocarpus.

Conch Shell, a species of Turbinella, see Shells, also Beads, B 381.

Condiments, see Spices

Conessi Bark, see Holarrhena antidysenterica, Wall, APOCYNACEÆ

CONGEA, Roxb, Gen Pl, II, 1159

[1 1479; VERBENACEÆ.

Congea tomentosa, Roxb, Fl Br Ind, IV, 603, Wight, Ic, 1763

Vern.—Tamakanxe ka-jan BURM

References.—Kunl For Fl Burm, II 256 Roscoe in Roxb Fl Ind, Ed C B C, 477

Habitat.—A large climber in Chittagong and Burma, distributed to Siam Roxburgh says it is found also in Coromandel, where it flowers in the cold season, the Chittagong plant flowering in March The Flora of British India describes a variety—Azurea—as cultivated in North India All the species of this elegant genus are characterised by their purple bracts

C. villosa, Wight, Ic, 1 1479, fig B, Fl Br Ind, IV, 603 1764

A large climber of Pegu and Mergui, the leaves of which are used medicinally (Mason, O'Shaughnessy, &c)

CONIUM, Linn, Gen Pl, I, 883

Conium maculatum, Linn; DC, Prodr, IV, 242; UNDELLIFERE 1765

SPOTTED HEMLOCK, HEMLOCK, Eng, CIGUE, Fr, SCHIERLINGS, Germ

Vern.—Shawhrân ARAB; A rdamâna BOMB

References.—Pharm Ind, 104 Ansler Mat Ind, Preface p XII; O'Shaughnessy Beng Dispens, 769 Dymock Mat Med W Ind, 2nd Ed, 353; Flück & Hanb Pharmacog 299 301 U S Dispens, 15th Ed 194 454 Bent & Trim, Med II, 118

Habitat.—Met with in Europe and temperate Asia, common in England

Medicine.—Although this drug is commonly used in Indian pharmacy and largely imported no effort seems to have been made to cultivate the plant in the temperate regions of India
of the Greeks (the State poison of
(hardwood) Dymock says 'the
not appear to have been utilized b
"The seed is sold for 8 annas per lb.

MEDICINE.
1766

CONNARUS, Linn, Gen Pl, I, 432, 1001

1767

Very little is known regarding the Indian species of Connarus and

afford a useful oil

Connarus monocarpus, Linn, Fl Fr Ind, II, 50, CONNARACEÆ

Vern.—Sander, BOMB; Keda, lant, a-lâre, lant, BURM; Pals
114, SING

1768

C. 1768

CONVOLVULUS
arvensis

Connarus, Deer's foot Bind-weed

References—*Beddome, Fl Sylva App LXXXII* Wight and Arnott, *Prod Fl Pen Ind Or*, 141 *Thun, En Cey Pl*, 80, Kurz, *Pegu Report*, Bomb Gas LXXV, 330. Dals and Gills, *Bomb Fl*, 53. *Rheed, Mal*, VI, t 24

Habitat—A small tree or shrub of the Western Peninsula, from the Concan to Travancore, common on the Southern Ghâts, very abundant in Ceylon. Flowers yellow, fruit long, bright red, the tree becoming very ornamental when in fruit

Oil—The seeds yield an Oil

Structure of the Wood—The timber of this, as of most other species of the genus, is much valued for ornamental purposes

L
1760
TIMBER
1770
1771
Connarus nitidus, Roxb, in Hort Beng, 49

References—*Voigt, Hort Sub Cal* 265; *Gamble, Man Timb*, 114

Habitat—Said to be found in Sylhet and British Burma

Oil—Dr McLelland says that in Rangoon the seeds of this plant yield a quantity of sweet oil. The name *C nitidus* is not referred to by the *Flora of British India*, but it may be presumed that the plant which yields the oil in question is *C paniculatus*

1773
C paniculatus, Roxb, Fl Ind, Ed C B C, 505, Fl Br Ind, II, 52.

References—*Kurz For Fl Burm*, I, 327, *Gamble, Man Timb*, 114, *Wight*, III t 64

Habitat—Roxburgh followed by Voigt and Kurz describes this as "a large umbreller tree, but Hooker in the *Flora of British India* says it is 'a large climber' met with in Sylhet and the Khasia hills, in Chittagong"

1774
C speciosus, McLell

Vern—*Gnedoak kadon kadet* BURM

Habitat—Said to be a large tree of Rangoon Pegu and Tounghoo

Oil—McLelland says that the seeds yield an abundance of sweet oil

The above has been extracted from Dr Cooke's *Report on Oil Seeds*. The name *C speciosus* McLell, was taken apparently from *Balfour's Cyclopaedia*. It seems probable that the tree here alluded to is *C gibbosus* Wall—a large tree met with near Rangoon and in Tenasserim Penang and Singapore. The Burmese name *Gwe* (*Spondias mangifera*) seems very near to the above

Structure of the Wood—Balfour says of *C speciosus* "It has a large, heavy, and strong timber, white coloured, adapted to every purpose of house building"

1776
TIMBER.
1776
Conocarpus acuminata, Roxb see Anogeissus acuminata Wall, COMBRETACEÆ, A 1146

C latifolia, Roxb see Anogeissus latifolia, Wall, A 1149

Construction and Railway purposes—Timbers suitable for, see Cart and Carriage Building C 632

CONVOLVULUS, Linn, Gen Pl, II, 874

1777
Convolvulus arvensis, Linn, Fl Br Ind, IV, 219 CONVOLVULACEÆ.

DEER'S FOOT BIND WEED

Syn—*C MALCOLMI* Roxb *Fl Ind*, Ed C B C, 159

C. 1777

COPPICE or COPSE.

Plants for Coppicing.

greenish. It has a cheesy odour and flavour. The bazar *Scammony* in Bombay, Dr. Dymock states, is all false, and is made at Surat

[DC.; COMPOSITE.

Conyza alopecuroides, Lam.; see *Pterocaulon alopecuroides*,

C. anthelmintica, Linn.; see *Vernonia anthelmintica*, Willd.

C. balsamifera, Linn.; see *Blumea balsamifera*, DC.

1785 Coawawanoo Oil.

This oil is said to be prepared from the Chelonian reptile *Capuna olivacea*, Gray—see *Turtles*.

Cookia punctata, Hark; see *Micromelum pubescens*, Blume, Var. 1st; *RUTACEÆ*.

1786 Copal Gum, or Gum Anime.

A hard, transparent substance, resembling Amber, found as a natural exudation from certain trees. This substance is chiefly obtained from

Zanzib

ing to

but th

tion.

much

masse

chiefly

Brazil

Copal

by *Guibourtia copalifera*, and Indian Copal from *Vateria indica*, which see. The Australian and New Zealand Copal is the produce of *Damara australis* (*CONIFERÆ*). This forms large solid masses, often found in places where the trees do not now occur, and in New Zealand is known as *Kauri* and in European Commerce as *DAMMAR* or *COWDIE PINE*.

Copper, see *Cuprum*.

1787 Coppice or Copse—Plants suitable for—

The following, among many others, are plants specially mentioned as suitable for this purpose; but those given under *Hedges* and under *Pollard* may also be added:—

Acacia arabica.

Acer Campbellii

Albizia Lebbek

Anogeissus pendula,

Bauhinia Vahl.

Carissa diffusa.

Castanopsis indica,

C. tribuloides.

Casuarina equisetifolia.

Cedrela serrata.

C. Toona

Celtis australis.

Dalbergia latifolia.

Helicteres Isora.

Hemitelia littoralis.

Lagerstroemia parviflora.

Lebdiereopsis orbicularis.

Mæsa montana.

Odina Wodier.

Pithecolobium dulce.

Populus euphratica.

Prosopis spicigera.

Quercus acuminata.

Q. semecarpifolia.

Strobilus asper.

Tecium macrostachyum.

Coptis or Mishmi Teeta.

COPTIS
Teeta.

Copra or Khopra—The dried kernels of the cocoa-nut, see *Cocos nucifera*.

COPTIS, *Salisb.; Gen. Pl., I., 8, 953.*

1788

The name COPTIS has been given in allusion to the much-cut leaves of the plants which have been referred to this genus.

Coptis Teeta, *Wall; Fl. Br. Ind., I., 23; RANUNCULACEÆ.*

1789

COPTIS OR GOLD THREAD, COPTIDIS RADIX, OR MISHMI TITA.

Vern.—*Tita*, Ass.; *Mamira*, or *Mamirān* (DYMOCK), HIND; *Mahmira*, SIND, *Pala karosana*, SIND. Rice says that *tita* is a corruption of *tikla*, SANS, "bitter"

References.—*Voigt, Hort. Sub. Cal., 3; MacIsaac, Trans. Med. and*

Habitat.—A small, stemless herb, with perennial root-stock, met with in the temperate regions of the Mishmi Hills, east of Assam. Cooper says that the plants grow on the ground among the moss around the stems of trees. "From each root," he remarks, "springs a single stem, about four inches high, bearing three serrated leaves, attached to the head of the stalk-like elongated trefoil."

Pereira (*Pharm. Jour., XI., 1852, p. 204*) was the first to suggest that *teeta* root might be the *Maupāc* or the *Maupā* of the early European writers on medicine. He founded this opinion mainly on the fact that *mahmirā* is the name of a drug used in Sind in the treatment of eye

HISTORY.
1790

... which the *Maupāc* was imported into India from which, he says, possessed it and the Chinese plant *cang-lien*, &c.) have by modern writers been recognised as *Coptis*. Dymock says *mamirān* is

... rium clears the sight, and as a snuff the brain, and that it relieves tooth-ache. Internally it is given in jaundice, flatulence, and visceral obstructions" (*Mat. Med. West. Ind., and Ed., 18*).

Dymock further remarks that two kinds of the drug are at the present day met with in Bombay. The best quality is only about the thickness of a crow-quill or a little thicker; it is a yellowish rhizome, hav-

1791

C. 1791

Coptis or Mishmi Teeta.

COPTIS
Teeta.

HISTORY.

drugs imported into India, or may have been conveyed overland from the Indo-Chinese frontier to Chinese ports. Hence, as far as our present information admits of conclusions being drawn, there exists a strong probability that the bulk of the Chinese drug is not Coptis Teeta at all, but the root of some more easily procurable plant.

It is, however, to be observed that the Chinese received from salt traders,

to 15,000 feet elevation, and is a powerful bitter tonic, known by the Tibetans. The suggestion above that much of the *tita* sold in India might be *Picrothiza* was made before the writer thought of consulting Sir Joseph Hooker's *Himalaya Journals*; and it is, therefore, almost safe to add that the Tibetan name *hoonling* may have been the original of the Chinese *honglane*, *h'wang-lien*, *sou-line*, &c., and hence Dr. Pereira

1794

ference that, in ancient times, there may have existed a much larger export *in tita* than takes place at the present day. It is much more likely that a

possible, however, that in later times the Chinese supply may have been

1795

the treatment of eye-diseases, simply, I believe, because it has a yellow watery juice, as every plant with a yellow juice seems to be by them considered a sovereign medicine, and all are called indiscriminately *mamfrán*. He further states that the roots of *Geranium Wallichianum* were shown to him as a medicine called "*mam-fran*."

1796

It has been pointed out by chemists that both Coptis and Berberis

after the same fashion as the *Maxipás* of the ancients. But berberine is present in a great many other yellow and bitter substances, and it may therefore have been a mere coincidence (suggested by external appearances) that the root now called *mamfrán* and the *Maxipás* came

1797

Coptis
Teeta.

Coptis or Mishmi Teeta.

HISTORY.

ing upon its projections where the roots have been broken off. The whole rhizome is jointed, but the upper end is often more distinctly so, and the remains of the sheathing leaf-stalks are often attached. The second kind is considerably thicker and covered with thin wiry rootlets; it often branches at the crown into two or three heads, which terminate in tufts of leaf-stalks crowded together, and not separate as in the first kind. Both of these rhizomes are spongy, and the centre is woody; the first is purely bitter. The second kind with the description of that drug in the *Pharmatographia*. While accepting this opinion it may be here stated that considerable confusion still exists in the European literature of the subject.

It is an interesting feature in the history of this drug that it continues to be imported from China, even although the Bengal supply reaches India through Assam. Indeed, it may be doubted how far the

Assam from the Chinese frontier. It may, however, be that we do not know the plant which yields the Chinese drug. In Japan *Coptis acemooefolia* affords a medicinal root, and it is, therefore, just possible that a portion of the Chinese drug may be obtained from one of the allied genera *Coptis*, *Isopyrum* or *Helleborus*, although possibly an undescribed species. Mr. Christy (*New Com. Pl. and Drugs*, No. 4, p. 53) says—"The Japanese character ('oh-ren,' meaning yellow ren), is exactly the same as the Chinese one for 'huang-lien,' which is the rhizome of *Coptis* Teeta, Wall, and not a *Justicia* as stated by Dr. Smith in his *Chinese Materia Medica*." May it not be possible that the *Coptis* Teeta to which Christy alludes is the drug as described in the *Pharmatographia*? Dr. Dymock's account of the imported Chinese thicker form of the *mamir* of Bombay recalls, however, some of the forms of a drug sold in Bengal under the name of *Katki* or *kuri* (*Katika*, Sans.)—a drug now generally recognised as obtained from *Picrothiza Kurroa*. Dr. Dymock thinks there is but one root sold in India under the name of *kuri*, but in connection with the Calcutta International, and again with the Colonial and Indian Exhibitions, London, the writer had three or four widely different roots consigned to him under the name of *kuri*. He is,

of the root of tances are frequently offered as *kuri*. May it not be possible that one of the roots known in lower India as *kuri* is in the upper and western provinces sold as *tita*. The latter is distinguished by its additional strength from the well-known *tita* which is done from Kumaon and also from *Isopyrum*—*pilijari*—as a substitute. It seems likely that *Actaea* Both these are abundant plants, is sufficient for the present to *mishmi tita*. But it may be it all, and, indeed, as already t of the Chinese empire. The true *tita* sold in Upper and Western India may thus be *mishmi-tita* that may have found its way by re-exportation into the returns of the Chinese

Coptis or Mishri Teeta.

COPTIS
Teeta.

HISTORY.

drugs imported into India, or may have been conveyed overland from the Indo-Chinese frontier to Chinese ports. Hence, as far as the present information admits of conclusions being drawn, there exists a strong probability that the bulk of the Chinese drug is not *Coptis Teeta* at all, but the root of some more easily procurable plant.

Sir J. D. Hooker, who in 1849 accompanied a vessel from salt traders, met with near the frontier, a preserved afsar¹ of the root of one of the many bitter herbs called in Bengali *teeta*,² but he alludes to the present as that of *Picrothiza*, a plant³ of the *Saxifragaceae*, which grows at from 12,000 to 15,000 feet elevation, and is a powerful bitter called *te-ching* by the Tibetans.⁴ The suggestion alone that made of the *teeta* sold in India might be *Picrothiza* was made before the writer thought of consulting Sir Joseph Hooker's *Himalayan Journals*; and it is, therefore, almost safe to add that the Tibetan name being may have been the original of the Chinese *Long-yan*, *kuang-shien*, *kuang-shin*, &c., and hence Dr. Pereira may have been mistaken in referring the *Maipis* of the ancients to *Coptis Teeta*, since it is this imported Chinese drug that is the *mamirán* of Upper India. Further, it seems even probable that the knotty, yellow, often tam-fied rhizomes of *Picrothiza*—according to modern writers the spurious *mamirán* of the Indian Lagers—may have been the drug originally so called, or at least been the Indian drug which most closely resembled the

1794

ference that, in Ancient times, there may have existed a much larger export *infusa* than takes place at the present day. It is much more likely that a drug found throughout the Himalaya would have been in early times carried to the drug-shops of Central, Northern, and Southern Asia rather than that the root of a plant found only within a very limited area of an inaccessible country should have come to be in extensive demand. It is possible, however, that in later times the Chinese supply may have been drawn from the Assam frontier, and ultimately conveyed, to some extent, in the admittedly superior root of *Coptis Teeta*, until modern writers came to view the *mamirán* as *Coptis* and not *Picrothiza*. Dr. Aitchison, in his second paper on the Flora of the Kuram Valley, says: "In this year, collected *Corydalis ramosa*, a plant employed medicinally by the natives in the treatment of eye-diseases simply, I believe, because it has a yellow watery juice, as every plant with a yellow juice seems to be by them considered a sovereign medicine, and all are called indiscriminately *mamirán*." He further states that the roots of *Geranium Wallichianum* were shown to him as a medicine called "*mamirán*."

1795

1796

It has been pointed out by chemists that both *Coptis* and *Berberis* contain a large quantity of the alkaloid *berberine*; and the somewhat significant fact has to be added that the drugs obtained from these plants are used in catarrhal and rheumatic affections of the conjunctiva very much after the same fashion as the *Maipis* of the ancients. But *berberine* is present in a great many other yellow and bitter substances, and it may therefore have been a mere coincidence (suggested by external appearances) that the root now called *mamirán* and the *Maipis* came

1797

COPTIS
Teeta.

Coptis or Mishmi Teeta.

HISTORY.

be viewed as militating against its having been adopted as a substitute for a drug for which Coptis would have proved more suitable. At the same time the Indian use of *mamirān* in the treatment of eye affections is but a

Materia Medica

mamirān. The

while the drug

Picrorhiza was known to the earliest Sanskrit writers. The late Dr. U. C.

but

old

ica.

Not only, therefore, were the words *tītā* and *mamirān* unknown to the Sanskrit writers, but it seems conclusively established that even the drug Coptis Teeta is but of modern introduction into India. The Muhammadans were so little familiar with Picrorhiza that they frequently confused it with Hellebore, and may thus be readily believed to have given to Picrorhiza or to Coptis, when separately presented to them, the name of *mamirān*—the name of a drug which either or both may possibly have closely resembled. The Hindus are uniformly precise and accurate in their information regarding Picrorhiza, but say nothing of Coptis. The earliest writers on Indian Materia Medica who allude to Coptis attribute to the indigenous and imported Chinese drugs tonic properties of remedial value in the treatment of nervous diseases and in debility after fever; they rarely make any mention of its use as a collyrium in eye affections. The tonic properties of Coptis are possessed in a scarcely less degree by Picrorhiza; and it may be concluded that Mir Muhammad Hussain's de-

Collection.
1798

from a thick bed of dry moss, the roots of which are
plant growing abundantly. The roots (from which, when brewed and
steeped in hot water, the famous febrifuge is made) are embedded in
moss. From each root springs a single stem, about four inches high, bear-
ing three serrated leaves, attached to the head of the stalk-like elongated
trefoil. The Mishmees gather the roots towards the end of the rainy
season, and carry them packed in tiny wicker-work bamboo baskets to
Sadiya, where they are eagerly bought by Assamese and Bengali mer-
chants." Regarding
to the Assam Govern
that the Deputy Com

Secretary

say

ward

Com-

tītā

it is brought

chittack each,

ice at which the

but the small-

cers is out of all

tail price which

the drug fetches. Dr. Dymock says of the Bombay supply: "Both

CORAL.

Tecta: Coral.

MEDICINE

"*Thalictrum foliolosum*, DC., common at Mussooree and throughout the temperate Himalaya at 5,000 to 8,000 feet, as well as on the Khásia hills, also affords a yellow root, which is exported from Kumáon under the name *Momiri*, and which it is possible may have been mistaken for *Coptis* Tecta." "In Kashmir the roots of a *Swertia* are collected and tied up in bundles and are passed off as a substitute for *Coptis*. They resemble the true root greatly." (*Surgeon-Major J. E. T. Aitchison, Simla.*) See n previous paragraph, where a *Corydalis* and a *Geranium* are stated to have both been found to be used, in Afghánistan, as a drug called *mamirán*.

CULTIVA-
TION.
1803

CULTIVATION OF THE — In 1803 the first trial was made at the
b.
tl
a'
fc
found a remunerative crop.

1804

CORAL.

A calcareous structure formed by certain minute animals, which belong to

1805

Actinozoa, calcar
giving origin to
what resembling
wall becomes calc

1806

Ctenophora (or free swimming marine polypes) do not form a calcareous skeleton. Of the ZOANTHARIA two tribes, the ZOANTHARIA SCLERODERMATA

CORAL.

Coral.

Habitat.—The Coral zone extends on either side of the Equator for about 1,800 miles. Mr. J. Murray, of the *Challenger* Expedition, has pointed out, however, that within this area the corals abound most on the western side of the Atlantic and Pacific Oceans, a circumstance account-

coral luxuriates requires to have a surface-water temperature of 70° Fh., and to no. . . . outlying . . .

finds a c . . . deep-water has a temperature much below that in which the reef-forming corals can live, and this fact may therefore be one of the governing influences that confines the corals not only within certain geographical regions but fixes each species within its area to a certain depth of water in which alone it is found to grow. Beyond the area of the reef-forming corals, the ornamental corals occur, and luxuriating, under lower temperatures, they are found in tropical seas at much greater depths than the reef-form water. low-water cally so they will

as the older landward and exposed portions are killed by being carried above the level of the water. This was the theory established by Darwin, and universally accepted for a quarter of a century, the atolls being viewed as monuments erected by the Actinozoa to a vast Pacific continent which had gradually sunk beneath the ocean. While this may take place, a new school has advanced the theory that it is by no means essentially necessary that to construct an atoll, the island which it encircles need be subsiding. Growth is attributed to the food materials being most abundant along the face of the reef, the approaching water being richer than that within the lagoon. It is even further explained that the chemical action of the sea-water decomposes the dead coral, thus excavating the shallow basin (or lagoon) that exists between the growing face of the reef and the land. But if this theory be admitted we have to explain the fact that once upon a time a coral laying the foundation of the present face of the reef must have existed in a depth of water under which we have no evidence of its having the power to live, or then presume the growing rim of the reef to be advancing cup-like from a peduncle situated at a depth in which the first portion of the colony found it possible to live.

at least be view
theory be still ma
tionably
level of th
are being

A.—CORAL REEFS.

In the Manual of Geology of India, it is stated that the coral reefs of the Andaman Islands should become a source of cheap lime for Calcutta. "The idea has been suggested more than once during the past twenty years, and it is supposed that the only objection to it arises from the necessity for the presence of coasting vessels which would be involved, and the consequent risk of the convicts escaping; but with so pure a source of

REEFS.
1809

C. 1809

Coral Reefs.

CORAL.

lime, abundant fuel, and labour at command, there can be little doubt that Calcutta might be supplied with excellent lime at a comparatively small cost, and a useful and profitable occupation would be thus afforded for the convicts."

"In 1882 some experiments were made by the Public Works Department with lime, at Barrackpore, from coral brought up as ballast from the Andamans. The cost of the lime when burnt, exclusive of freight and collection, was from Rs 35 to Rs 45 per 100 maunds, as against the market price of Sylhet lime from Rs 5 to Rs 10 per 100 maunds."

"Opinions differ slightly as to the relative merits of the two limes, but on the whole the coral lime was considered equal to the other, whether it would answer best to burn the lime in the Andamans and bring it up slaked like the Sylhet lime, or to burn it where fuel is more expensive, can only be determined by actual trial."

In the Nicobar Islands upraised coral reefs are found on the coast of all the islands and on the Car Nicobar, Bompoka, and several other islands these coral banks are of great thickness, and are raised 30 or 40 feet above the sea. The atolls arou

CORAL REEFS

Andamans.
1810Nicobar.
1811Sind.
1812

allied form,
non " So
s pass up
unding in
Geology of
scattered

Bombay.
1813

about the surface of
and Rán, indicating
The species of cora
fessor P. Martin I
Indica, Series XIV,
nues. "The whole o
wánagar westward,
dead coral reef

Cutch.
1814

posed at low spring
up to high tide level,

The coral has very
substitute for stone

for building, but not with very satisfactory results, owing to salt impregnation. The existence of these dead coral reefs is, of course, a proof that the country has been rising during late times." Far to the south Mr Foote, in his account of the Geology of Madura and Tinnevely, states that he found extensive upraised coral reefs, and upon these he lays stress as proving the rise of that portion of India. Writing of the scarp of coral near the zemindar's bungalow on Rameswaram island, he says: "Of its true coral reef origin there can be no possible doubt, as in many places the main mass of rock consists of great globular meandrinoid corals or of huge cups of a species of *Porites* which, beyond being bleached by weather action, are very much altered and broken up, so that it is difficult to ascertain their original form. I could ascertain, not having a well-section, a

Madura.
1815
Tinnevely.
1816

CORAL.

Coral Reefs.

CORAL
REEFS

Chattiram, the thickness of the coral reef exposed above the surface of the water is at least 10 feet, and probably much more." Further on he remarks: "At the Pamban end of the raised reef it shows a slight northerly dip, and masses of dead coral, apparently *in situ*, protrude through the sand below high water mark. Reefs of living coral fringe the present coast, but these I say whether the corals now growing there are the same as those which formed the reef now upraised, I found,

occurring as fossils in the latter, belong to species now living in the surrounding sea." "All the small islands occurring along the Tinnevely and Madura coast appear to consist of sand based upon coral reefs which are largely exposed at low tide. The published large scale charts of Pamban Straits show extensive coral reefs surrounding the five most easterly islands; Moosel, Munnauli, Pullee, Pulleevansel, and Cooresuddy. The only one I was able to visit, that on which stands the Tutikorin light-house, shows no coral on the surface, which is sandy, but the island im-

group of islands (the *Madras*) along the coast. In his long and interesting account of these sub-recent marine beds, Mr. Foote adds: "It is impossible to resist the speculation that it was this

Trichinopoly.
1817

on an old coral
ling, outlines of

described by
unaltered wa
bedded coral
shells, newly
polished as t
ing coast, with even their zig-zag colour-markings sun-bleached, and hard by stretched a bank of coarse shingle that differed in no essential respect from a modern beach.

"But though, to an uncritical eye, the shells of that old sea might seem very like the volutes, olives, cowries, and ark-shells now thrown upon the Madras sands (and perhaps, indeed, they were their remote ancestors), it needed but to look on the great coiled ammonites scattered here and there in the broken ground, to know of a surety that around me lay the relics of a cretaceous sea. When organisms, the coarse sandy deposits were slowly accumulating in a shallow fields and hop gardens of Surrey and tom of South-Eastern England, Nor.

C. 1817

Ornamental Corals.

CORAL.

thousands of feet of white calcareous mud that, long since upheaved and hardened into chalk, greets the homeward-bound Indian in the Dover Cliffs, had yet to be slowly extracted through long ages from the sea water by minute organisms long since extinct."

B.—ORNAMENTAL CORALS.

ORNAMENTAL
CORALS.
1818

Very little can be learned for certain of the indigenous living ornamental corals. Indeed, it seems probable that in some of the passages already quoted, reference has been made to coral as a generic name, some of the forms there mentioned being, s . . .

here made should be preserved, since, for ornamental purposes, it is or a calcareous substance of sufficient into ornamental structures. In the various forms, shapes, and colours ar (*Oculina virginica*), "brun-tone cor" "organ-pipe coral" (*Tubipora musica*), the sea-pens (*Pennatulæ*), the "sea shrubs" (*Gorgonida*), the "black coral" (*Antipathes*), and last but by far the most valuable of all the "Red Coral" (*Corallum rubrum*). Most of these genera are temperate, but the *Gorgonida* attain their greatest development in tropical seas. "White coral," of no market value, is

White
1819
Brainstone.
1820
Organ-pipe.
1821
Sea-pens.
1822
Shrubs.
1823
Black.
1824
Red
1825
Burman.
1826

of the coast of Amherst and Mergui that elegant specimens of *ACTINIA* are very rare, but he describes a species of *MEANDRIA* which he calls "club-shaped Porites." He also says—"I have noticed in the bazars, though I have never gathered it on the coast, a curious species of coral resembling the horse-tail Isis. It is branched like a tree with white striated stony joints and black horny smaller joints between, which render the whole flexible." It may be here remarked that many of the scleroblastic corals have alternating portions of a calcareous

Tenasserim
1827

commerce, it does not grow like that, and the red colour is confined to the epidermis, the substance of the coral within being grey."

In concluding this brief review of the literature of the Indian ornamental corals, it must be admitted that we are grossly ignorant of the subject. There are no coral fisheries in India, and we do not know whether or not this is due to the absence of corals of commercial value, nor do we possess any knowledge as to the likelihood of the more

1828

CORAL.

Trade in Corals.

valuable corals succeeding, if introduced into Indian waters. No effort has as yet been made to propagate new species or improve the existing Indian corals.

TRADE.
1829

TRADE IN CORAL.

Some conception may be arrived at of the magnitude of the trade in Coral when it is recollected how many races of people in India regularly wear necklaces of coral. How far the prized ornaments may be derived from the finest red coral is obtained from the coast of Malabar, the pale colour, are said to be the operation of preparing, piercing, and rounding; but in accomplishing these operations there is generally an immense waste. The rejected pieces and inferior qualities are exported to Asiatic countries.

have been partly caused by the imposition of a duty of 7½ per cent. in April 1829. The duty was increased to 10 per cent. in 1830.

Prepared.
1830

the year these in what amount received by the Government. Of the £2,000 again Of

Beads.
1831

by O'Connor says of

Imitation.
1832

bought by these classes to be worn as a man is prosperous, alternating with gold beads. Almost all the coral we receive is brought to Calcutta, whence it is distributed over the provinces mentioned, to be sold chiefly at the larger fairs. It is principally

the Indian importation consist of Indian pressed a large community by the Hindus. A rotating, but in the form the favourite imitation corals, for sale at fairs are real.

MEDICINE.
1833

Medicine.—In addition to being used for adornment ornamental is used from a very ancient time and are "is purified by being in pearls and corals are used for the same purpose, namely, in "urinary diseases, consumption, of weak persons" Almslie ed coral when calcined

CORCHORUS
acutangulus.

The Angular Fruited Corchorus.

JUTE.
1839CORCHORUS, Linn.; *Gen Pl*, I, 235.

The generic name for this group of annual plants is derived from the property of the leaves (*κορη* the pupil of the eye, and *κορραι* to purge or clear). There are about 36 species distributed throughout the tropics, of which India possesses 8. But so uniformly are these plants met with in Asia, Africa, and

classes of the people take them boiled with other vegetables in the form of soups as stomachics or appetizers, the lower classes use them as articles of food." Sir Walter Elliot gives *C. olitorius* the Telugu name of *Pirinta* *capularis* but *Patti* he says is the vernacular name of *Pareira*, and of *Jute* has writer accepts as *bale* that hybrid or

1840

Corchorus acutangulus, Lam; *Fl Br. Ind*, I, 398; *Wight*, [Tiliaceae.Syn — *C. vuscus*, Roxb, *Fl. Ind*, Ed C.B.C, 429, *le t* 739Vern.—*Tufádt*, BENGReferences — *Dals ant Gds*, Bomb *Fl*, 25; *Kura*, *Contrib Burmese Fl*, 130, *F von Mueller*, *Sci Extra Trop Pl*, 88

Botanic Diagnosis — Stem hairy along certain sides between the nodes (not all round), the whole petiole having spreading hairs, and being woolly along the upper surface, both surfaces of the leaf hairy, those of the upper adpressed, margin often minutely ciliate, nervules reticulate (not parallel anastomosing, as in *C. olitorius*). Capsule short (1 inch long at most); winged, beak cleft into 3-4 spreading arms each, often bifid, base of capsule contracted, position of faded flower indicated by a sharp groove. Seeds small, broader than long, squarish, hilum a large thickened patch in one corner.

A very distinct, and perhaps the most abundant wild species in India,

parts of
any and
having
a row of
a com-
of India

a synonym for
plant, and *istand* as the bazar name for the *leus* above
association of the scientific names incorrect, but *biphalis* is the
name given to *C. Antichorus*, and *istand*, the seeds, to *C. trilobularis*

C. 1840

The Round Fruited Corchorus.

CORCHORUS
capsularis.

Mr. Hem Chunder Kerr speaks of this as "the species *C. fuscus*, or the wild variety of *C. capsularis*." It would almost seem possible that from *C. acutangulus* and *C. triocularis* the cultivated forms of jute might have

JUTE

the tips spreading somewhat as in *C. acutangulus*. Duthie's 7,121 has the fringe, capsules, and hairs of *C. triocularis* with the seeds of *C. olivaceus*."

Fibre.—A coarse fibre is sometimes extracted from this species and McEller alludes to this plant as an occasional source of jute.

FIBRE.
1841

Corchorus Antichorus, Rumph. *Fl Br. Ind. I.*, 398, Wight, *lc.*, 1842

Syn.—*Corchorus humilis*, Jussieu. *Antichorus depressus*, Linn.

Vern.—*Na'phul*, Hindi; *Na'phul*, *Adant*, *Ap'hal*, *Laphal*, *La'una*, *Pa*, *Shihul*, Sind.

References.—Dale, *et Galt*, *Bomb. Fl.*, 351 Murray, *Fl. et Drugs*, Sind, 18.

Habitat.—A common prostrate, shrubby, plant, wild in Upper India, from the N.W. Provinces to the Punjab and Sind, and south-west to Kathiawar, Gujrat, and the Deccan—a member of the Indian desert flora. Distributed to Afghanistan, Aden, Tropical Africa, &c.

con
it is

by camels

FIBRE.
1813
MEDICINE.
1844FODDER.
1845

1846

C. capsularis, Linn., *Fl Br. Ind. I.*, 397; Wight, *lc.*, 1311.

Vern.—*Gh' nali' d'at* (according to Roxburgh), *Sarchid* according to U. O. Dutt, Bevo. The last mentioned author in the Glossary to his *Mat. Med. of the Hindus* gives this plant the Sanskrit name *Kilaidia*.

In Bengal the words *phul* and *karkid* are often given to both the jute-yield-

1847

names for *C. capsularis* during an enquiry instituted in 1874 into the subject of the jute cultivation in Madras.

C. 1847

CORCHORUS capsularis

The Round Fruited Corchorus

JUTE

References — D. L. E. I. J. F. I. C. O. R. C. H. O. R. U. S. C. A. P. S. U. L. A. R. I. S.

DeCandolle, Orig. Cult. 11, 131

Botanic Diagnosis.—Alone distinguishable from *C. olitorius* by the short rounded capsule—a very important character. Gamble's No 15,912 has one capsule nearly round, while the others are distinctly those of *olitorius*, but some are 4-valved, others 5-valved. Kurz's No 1231 of *C. acutangulus* has both 4- and 5-valved capsules, and Clarke's No 24,899 has a 3-valved capsule. Clarke's No 31,637 of *C. trilocularis*, has a 4-valved capsule, and Hooker and Thomson's sample of that species, from the Panjab, has a 3-valved capsule. The capsule is thus variable.

Habitat.—A common plant "throughout the hotter parts of India." This statement, originally made by Roxburgh, is current in the literature of jute. While it need not necessarily be implied that a plant is wild (e.g., indigenous) in the area where it is common, still that is the opinion popular writers have derived from the above carefully worded botanical description. The major portion of all we have learned regarding *Corchorus capsularis*, during the past century, leads to the opposite conclusion. There are, however, a few notices of the plant that point either to its being indigenous in India or indicate acclimatisation so successful as to have deceived modern botanists. Mr J. F. Duthie has, for example, favoured the writer with a note to the effect that he found *C. capsularis* on the banks of the Gumpu near Judalpur in what appeared a wild condition. A Native of the place gave the name of *Harrana* a word which has no relation to any of the names given to the Indian species of *Corchorus* in other parts of the country. Mr W. A. Talbot, in a list of the Kanara plants (*Bomb. Gas. XV, 1, 428*) states of this species that it is "found on road sides sparingly throughout North Kanara." On the other hand Dr. Prain (Officiating Superintendent of the Botanic Gardens) has forwarded to the writer, for personal inspection, every sheet of *Corchorus* "cultivated" has not

1848

rain should have had except perhaps one by Kurz from the Pegu Yomah, Burma which, however, may be an escape." Kurz himself says of *C. capsularis* (*Contrib. Knowledge Burmese Flora p. 130*)—"Cultivated all over Burma and frequently seen in de- of the borders of forests around villages &c." It is the

1849

ith, ten bot of not ed ted nly om specimen "what appeared on " no hesitation in pro- India. *C. decemman-* nouncing the no- , been reduced to gularis of Roxb. a native of Bengal his *C. decemman-* C. *olitorius*, but c as to While re to

C.

The Round Fruited Corchorus.

CORCHORUS
capsularis

its nativity. Edgeworth says of the Banda district, N-W Provinces,

JUTE.

discovered both wild and cultivated, that *C. capsularis* does not occur in Madras. DeCandolle, after enumerating all the countries where the plant is cultivated (*viz.*, the Sunda Islands, Ceylon, India, Southern China, the Philippine Islands, and Southern Asia generally) says "I am not convinced that the species exists in a truly wild state north of Calcutta, although it may perhaps have spread from cultivation and have sown itself here and there" The writer spent many portions of that Presidency either *C. capsularis* or *C. olitorius* rather indigenous condiments in some parts of Western India, but grave doubts may be entertained as to either being natives of Bengal,—the province where they are now mainly cultivated, and where they exist frequently enough as weeds around the cultivated jute fields. The suggestion is offered, that, by experimental cultivation, it might be found possible to produce forms of *Corchorus* from some of the truly wild species which would closely approximate to *C. capsularis* and *C. olitorius*. With the imperfect knowledge we possess of this subject, the writer would be much more willing to admit

1850

based on the length of the fruit vessel (round in *C. capsularis* and elongated in *C. olitorius*) is, to say the least, scarcely worthy of as much recognition by the cultivators in distinct

various cultivated forms that yield the A similar distinction in the shape it was made to give origin to certain can be produced from the seeds of any

one by careful cultivation

It is noteworthy that definite Sanskrit names should not exist for these most useful plants, while other plants of far less value have assigned to them names so precise as to distinguish their varieties, to separate their wild from their cultivated forms, and to indicate every possible structural peculiarity. There are neither Arabic nor Persian names for the species of *Corchorus*, known to the people of India, and the greatest uncertainty exists regarding one or two Sanskrit synonyms that have been assigned to the jute-yielding species. Indeed, it seems highly probable

1851

CORCHORUS
capsularis.

The Round Fruited Corchorus.

JUTE.

urged that when Roxburgh was told that the plant grown in the Botanic Garden was jute, there were in all probability no such dealings in the fibre between Calcutta and Eastern Bengal. Besides, Mr. Kerr rejects

that jute is in no way a waste, be implied by the word *nchi* would simply be that it was in

drawn from the cocoons—the waste ch in India is made into *chasam*—but as Mr. Kerr puts it, “an official mate-

1852

rial like *ort*.” It must be admitted that the long golden bands of jute fibre bear a close resemblance to the ribbands of waste silk or *chasam*, and that there are many much more

he word

nt, *jhot*,

pointed

s under

Orissa,

and that, therefore, the name jute given by Roxburgh, the first European writer who used that name, was in all probability a softened form of *jhot*, a word which may be admitted to have come from the Sanskrit *ghuta*, unless

over O

ord to have prevailed all

the plant.

to have been given to

The C. olitorius and *kālasāka* to C. capsdevoted to the *Materna Medica* of the

krit medical works, he only gives the

hah have they refer, any

1853

simply means a “to silk, although ed as *patta-jam* thus relieving th

some form or other,

In its early usage it

1854

and not to the fibre Among the early synonyms for *patta* may be mentioned that of *Raja sana*, the large or noble *sana*, *kakkhata patra*, “the rough leaved,” and *sann*, the sunn-like—names which would suggest a later introduction than *Crotalaria juncea* to which *patta* is compared. This idea receives further support from the fact that while *sana* occurs in the most ancient Sanskrit works, *patta* appears in the comparatively recent In one of the references to *patta*, it is spoken of as the *chimi* (probably a misspelling for China) *pât*, a fact which would point to the cultivated jute plant having come to India from China. Mr. Hem

The Tufted Corchorus.

CORCHORUS
fascicularis.

Chunder Kerr reviews all the reports and early books of travel that refer to fibre or to rope-making in India, and finds that in none of these publications does there occur any mention of the word *jute* until 1796. In several works *jūt* is, however, mentioned as a fibre viewed in India as a form of hemp, but which by the home authors was pronounced to be more nearly allied to flax. By the beginning of the present century the word *Adras* completely superseded *jūt* as a general term for the fibre.

the cultivation of the plant has been introduced from some other country and most probably subsequent to the date of even the most recent Sans-

Eastern Bengal, especially on the islands and lowlying lands of the
 C. histories, on the other hand, occurs
 on the eastern side of the Hooghly river,
 and in Western and Southern
 India.

Although there are numerous references to *Patta*, *Jāla*, &c., in early

tion is fixed at 1872, in another at 1865, in a third before the date of the

Jute. (Cont. with C. olitorius in a further page.)

Fibre.—See a further page, and also Jute.

Medicine.—The last year died one and was almost the same patient, breakfasted and administered.

Oil — "

fighting purposes" (*Ramshunker Sen, Agri. Gas.*, 163).

Corchorus fascicularis, Lam.; *Fl. Br. Ind.*, I., 398.

VERN.—*Hirankhori*, *bhauphali*, BOMB.; *Yangli* or *ban-pdt*, *bil-nahita*, BENG.

Pymonk = a type of fish.

uaphnili is also given to C. Antichorus.

References — *Roxb, Fl. Ind, Ed. C. B. C., 429; Dymock, Mat. Med. IV. Ind., 2nd Ed., 115.*

Botanic Diagnosis.—Capsules small ($\frac{1}{4}$ – $\frac{1}{2}$ inch) almost cylindrical, very hairy, beak 3-4, splitting with the dehiscence of the capsule. Seed triangular or diamond shaped, more pointed at the lower end and very similar to those of *C. olitorius* but smaller.

JUTE.

FIBRE.
1855
MEDICINE.
1856
OIL
1857

1858

C. 1858

CORCHORUS
capsularis.

The Round Fruited Corchorus.

JUTE.

urged that when Roxburgh was told that the plant grown in the Botanic Garden was jute, there were in all probability no such dealings in the fibre between Calcutta and Eastern Bengal. Besides, Mr Kerr rejects

that jute is in no way a waste, be implied by the word *uchi*—would simply be that it was in

appearance like the first few threads drawn from the cocoons—the waste known in Europe as "ort" and which in India is made into *chisam*—but was not itself necessarily a waste, or as Mr. Kerr puts it, "an offal material like ort." It must be admitted that the long golden bands of jute fibre bear a close resemblance to the ribbands of waste silk or *chisam*, and

1852

on the other hand, the word Bilasore, and *ghout*, *phot*, *issa*. It has been pointed out in the Botanic Gardens under the name of *Orissa*, and that, therefore, the name jute given by Roxburgh, the first European writer who used that name, was in all probability a softened form of *phot*, a word which may be admitted to have come from the Sanskrit *phuta*, and to have prevailed all

been given to
Dutt's work is
ed from Sans-
the
it's much
olitorious.

1853

properties as known. It alludes to this species but makes no mention of *C. capsularis*. The leaves of *Jute* neither assigns *Jute* nor *Patta* to Jute and medicine. It was perhaps the first European writer who assigned to this name, the name *jingging-ganascha*, and while this has been reproduced by subsequent authors, the word does not appear to be in use in India at the present day, at least not in Hindustan proper. The Sanskrit names given above have already been commented on under *C. capsularis*. Mr Hem

Chunder Kerr points out that the word *bhanga* (given by various authors as a Bengali name for this plant) is not employed at the present day. It is derived from the Sanskrit *bhanga* (*Cannabis sativa*), and it is recalled in a remarkable way *Rumphius* name for *jute*, *gunja* or *ganja* (may not *gunny* name for *jute* have come from the same source?). In ever *jute* is mixed up with that of *hemp* or *sun-hemp*.

Alasie Stat Ind. II.
Not Dist. 512; Ind.
Biden Powell, P. Prot.
Stat Met Ind. 311
Murray 11 to 12, 13
Sind. 11; Henson, Sandage 11; 12; 13; 14; 15; 16; 17; 18; 19; 20; 21; 22; 23; 24; 25; 26; 27; 28; 29; 30; 31; 32; 33; 34; 35; 36; 37; 38; 39; 40; 41; 42; 43; 44; 45; 46; 47; 48; 49; 50; 51; 52; 53; 54; 55; 56; 57; 58; 59; 60; 61; 62; 63; 64; 65; 66; 67; 68; 69; 70; 71; 72; 73; 74; 75; 76; 77; 78; 79; 80; 81; 82; 83; 84; 85; 86; 87; 88; 89; 90; 91; 92; 93; 94; 95; 96; 97; 98; 99; 100; 101; 102; 103; 104; 105; 106; 107; 108; 109; 110; 111; 112; 113; 114; 115; 116; 117; 118; 119; 120; 121; 122; 123; 124; 125; 126; 127; 128; 129; 130; 131; 132; 133; 134; 135; 136; 137; 138; 139; 140; 141; 142; 143; 144; 145; 146; 147; 148; 149; 150; 151; 152; 153; 154; 155; 156; 157; 158; 159; 160; 161; 162; 163; 164; 165; 166; 167; 168; 169; 170; 171; 172; 173; 174; 175; 176; 177; 178; 179; 180; 181; 182; 183; 184; 185; 186; 187; 188; 189; 190; 191; 192; 193; 194; 195; 196; 197; 198; 199; 200; 201; 202; 203; 204; 205; 206; 207; 208; 209; 210; 211; 212; 213; 214; 215; 216; 217; 218; 219; 220; 221; 222; 223; 224; 225; 226; 227; 228; 229; 230; 231; 232; 233; 234; 235; 236; 237; 238; 239; 240; 241; 242; 243; 244; 245; 246; 247; 248; 249; 250; 251; 252; 253; 254; 255; 256; 257; 258; 259; 260; 261; 262; 263; 264; 265; 266; 267; 268; 269; 270; 271; 272; 273; 274; 275; 276; 277; 278; 279; 280; 281; 282; 283; 284; 285; 286; 287; 288; 289; 290; 291; 292; 293; 294; 295; 296; 297; 298; 299; 300; 301; 302; 303; 304; 305; 306; 307; 308; 309; 310; 311; 312; 313; 314; 315; 316; 317; 318; 319; 320; 321; 322; 323; 324; 325; 326; 327; 328; 329; 330; 331; 332; 333; 334; 335; 336; 337; 338; 339; 340; 341; 342; 343; 344; 345; 346; 347; 348; 349; 350; 351; 352; 353; 354; 355; 356; 357; 358; 359; 360; 361; 362; 363; 364; 365; 366; 367; 368; 369; 370; 371; 372; 373; 374; 375; 376; 377; 378; 379; 380; 381; 382; 383; 384; 385; 386; 387; 388; 389; 390; 391; 392; 393; 394; 395; 396; 397; 398; 399; 400; 401; 402; 403; 404; 405; 406; 407; 408; 409; 410; 411; 412; 413; 414; 415; 416; 417; 418; 419; 420; 421; 422; 423; 424; 425; 426; 427; 428; 429; 430; 431; 432; 433; 434; 435; 436; 437; 438; 439; 440; 441; 442; 443; 444; 445; 446; 447; 448; 449; 450; 451; 452; 453; 454; 455; 456; 457; 458; 459; 460; 461; 462; 463; 464; 465; 466; 467; 468; 469; 470; 471; 472; 473; 474; 475; 476; 477; 478; 479; 480; 481; 482; 483; 484; 485; 486; 487; 488; 489; 490; 491; 492; 493; 494; 495; 496; 497; 498; 499; 500; 501; 502; 503; 504; 505; 506; 507; 508; 509; 510; 511; 512; 513; 514; 515; 516; 517; 518; 519; 520; 521; 522; 523; 524; 525; 526; 527; 528; 529; 530; 531; 532; 533; 534; 535; 536; 537; 538; 539; 540; 541; 542; 543; 544; 545; 546; 547; 548; 549; 550; 551; 552; 553; 554; 555; 556; 557; 558; 559; 560; 561; 562; 563; 564; 565; 566; 567; 568; 569; 570; 571; 572; 573; 574; 575; 576; 577; 578; 579; 580; 581; 582; 583; 584; 585; 586; 587; 588; 589; 590; 591; 592; 593; 594; 595; 596; 597; 598; 599; 600; 601; 602; 603; 604; 605; 606; 607; 608; 609; 610; 611; 612; 613; 614; 615; 616; 617; 618; 619; 620; 621; 622; 623; 624; 625; 626; 627; 628; 629; 630; 631; 632; 633; 634; 635; 636; 637; 638; 639; 640; 641; 642; 643; 644; 645; 646; 647; 648; 649; 650; 651; 652; 653; 654; 655; 656; 657; 658; 659; 660; 661; 662; 663; 664; 665; 666; 667; 668; 669; 670; 671; 672; 673; 674; 675; 676; 677; 678; 679; 680; 681; 682; 683; 684; 685; 686; 687; 688; 689; 690; 691; 692; 693; 694; 695; 696; 697; 698; 699; 700; 701; 702; 703; 704; 705; 706; 707; 708; 709; 710; 711; 712; 713; 714; 715; 716; 717; 718; 719; 720; 721; 722; 723; 724; 725; 726; 727; 728; 729; 730; 731; 732; 733; 734; 735; 736; 737; 738; 739; 740; 741; 742; 743; 744; 745; 746; 747; 748; 749; 750; 751; 752; 753; 754; 755; 756; 757; 758; 759; 760; 761; 762; 763; 764; 765; 766; 767; 768; 769; 770; 771; 772; 773; 774; 775; 776; 777; 778; 779; 780; 781; 782; 783; 784; 785; 786; 787; 788; 789; 790; 791; 792; 793; 794; 795; 796; 797; 798; 799; 800; 801; 802; 803; 804; 805; 806; 807; 808; 809; 810; 811; 812; 813; 814; 815; 816; 817; 818; 819; 820; 821; 822; 823; 824; 825; 826; 827; 828; 829; 830; 831; 832; 833; 834; 835; 836; 837; 838; 839; 840; 841; 842; 843; 844; 845; 846; 847; 848; 849; 850; 851; 852; 853; 854; 855; 856; 857; 858; 859; 860; 861; 862; 863; 864; 865; 866; 867; 868; 869; 870; 871; 872; 873; 874; 875; 876; 877; 878; 879; 880; 881; 882; 883; 884; 885; 886; 887; 888; 889; 890; 891; 892; 893; 894; 895; 896; 897; 898; 899; 900; 901; 902; 903; 904; 905; 906; 907; 908; 909; 910; 911; 912; 913; 914; 915; 916; 917; 918; 919; 920; 921; 922; 923; 924; 925; 926; 927; 928; 929; 930; 931; 932; 933; 934; 935; 936; 937; 938; 939; 940; 941; 942; 943; 944; 945; 946; 947; 948; 949; 950; 951; 952; 953; 954; 955; 956; 957; 958; 959; 960; 961; 962; 963; 964; 965; 966; 967; 968; 969; 970; 971; 972; 973; 974; 975; 976; 977; 978; 979; 980; 981; 982; 983; 984; 985; 986; 987; 988; 989; 990; 991; 992; 993; 994; 995; 996; 997; 998; 999; 1000.

Botanic Diagnosis.—Glabrous, except the upper half of the petiole, and the primary veins on the under surface, where woolly hairs occur; nervules transverse, nearly parallel, petioled, and ascending. Capsule very long and glabrous, beak straight, remains of the flower forming a thick nail. Seeds somewhat triangular, pointed at both extremities, the surface more or less hairy, surface often roughened, so as to appear at first very hairy.

C. 1862

The Tufted Corchorus.

CORCHORUS
fascicularis.

JUTE.

Chunder Kerr reviews all the reports and early books of travel that refer to fibre or to rope-making in India, and finds that in none of these publications does there occur any mention of the word jute until 1796. In several works *pât* is, however, mentioned as a fibre viewed in India as a form of hemp, but which by the home authors was pronounced to be more nearly allied to flax. By the beginning of the present century the word *pât* was completely superseded by jute in all commercial correspondence.

the cultivation of the plant has been introduced from some other country and most probably subsequent to the date of even the most recent Sanskrit works. If a modern development, we can scarcely admit that the

Eastern Bengal, especially on the islands and lowly lands of the Meghna and Brahmaputra Rivers. *C. olitorius*, on the other hand, occurs chiefly on the lowly lands on the western side of the Hooghly river, more especially in the Burdwan district and in Western and Southern India.

Although there are numerous references to *Patta*, *Jûtâ*, &c., in early Indian writings, enough has been said to show that the greatest caution is necessary in founding too strong convictions that these names allude to the *Pât* and *Jûtâ* of to-day, the more so since jute cultivation in *C. acutangulus*, from various localities, by the local authorities as of and the Panjâb, there are none of *C. olitorius* in one district its introduction is marked as collected at Dehra. Before the date of the publication this may be the *C. olitorius* alluded to by some writers. In all and other writers on the Flora of Northern India. In the early period reference has been made under *C. capsularis* on jute, rice, cotton. Madras, it is stated that a considerable amount of *C. olitorius* is raised with *C. capsularis* in Ganjâm, Godavery, Krishna, and Nellore, but not for its fibre. In the districts of Ganjâm and Godavery it is wild in their districts. It is only distinct in the southern parts of the Madras Presidency where it

FIBRE.
1855
NICINE.
5

The Horticultural Society of Madras submitted in 1873 a report on the jute cultivation and manufactures of that Presidency, but in the following year wrote and informed Government that they had now discovered that the plant that yielded the so-called jute of their former communication was a species of *Crotalaria* and not of *Corchorus*. Roxburgh points out in the *Flora Indica* that there is a wild form of the plant known in Bengal as *tan-pât* or wild *pât* which has reddish stems. In his *Hortus Bengalensis*, he speaks of two varieties of *C. olitorius*, a green form (the *pât*) and a reddish (the *tan-pât*). This opinion is accepted by Ainslie and by

1864

C. 1864

CORCHORUS
olitorius

Jew's Mallow

JUTE

O Shaughnessy, both of whom call the green variety *C. olitorius* and the reddish *C. capsularis*. The term *ban* or *jangli pat* is, however, at the present day, applied in Bengal to *C. fascicularis* a distinct species from either of the above. Stewart remarks that *C. olitorius* is found wild in the Panjáb, but he does not give its Panjabi names, while he says it is the *ban pat* of Bengal, a circumstance that would seem to justify the inference that Stewart's wild *C. olitorius* should be corrected into *C. fascicularis*, the more so since that species is undoubtedly wild in the Panjáb, although not alluded to by Stewart. (For another error committed by Stewart see the remarks under *C. acutangulus*.) At the same time the writer, on looking over the Saharanpur Herbarium collections, found a specimen of the plant, correctly named *C. olitorius* which was

476), and on which the note occurs,

"The Saharanpur Herbarium, as already remarked, does not, however, possess a sample of *Corchorus olitorius*."

1865

If,
still be

we
apt

it as a truly wild form and not a product of cultivation (possibly from *C. acutangulus* and *C. trilobularis*) escaped and assumed a semi wild condition, then it might almost be safe to believe that it was the parent of all the cultivated forms of jute. In the writer's opinion however, its claim to being viewed as indigenous rests at present on doubtful evidence, but it may at least be confidently asserted that it is not wild in the districts where it is now or ever has been known to be cultivated for its fibre. Indeed, there is a strong probability that as a cultivated plant *C. capsularis* came to India from China or Cochin China, and that *C. olitorius* may have been produced in India. Its extensive use as a pot herb might explain its acclimatisation over so extensive an area as has been indicated. But more can certainly be said in favour of a possible Indian origin for *olitorius* than for *capsularis*. The latter would appear to have been cultivated in China before the date of its having been authentically known to the people of India. It

is the hood of Canton for many

Ormas Mr Hem Ohur

this name to the Sanskrit *au ma* signifying sixteen. The Chinese call *C. capsularis* *Ram-tszy-ma* or Chinese hemp. But in the same way *C. olitorius* has been known to the Egyptians and Syrians for a very long time, their acquaintance with it being possibly prior to the date of the evidence of a positive character, that a knowledge of the properties of the plant was possessed by the inhabitants of India. The Greek *hoxopog* was applied to a pot herb, but in all probability the plant alluded to was not the *Corchorus* of the present day. Accepting the derivation of the Greek word as implying a drug useful in the treatment of eye diseases, it may be pointed out that no such property is claimed for the species of *Corchorus*. It is perhaps only a fanciful idea, but this property of a collyrium associated with *μαρμα* and *πολυνία* with *τις* and *τις* recalls the properties of *Coptis Teeta* or *Picrochiza Karroa* is possibly in some strange way connected with the edible and medicinal properties of *hoxopog*. There is no good Hebrew name for jute, the word *malluach* mallow, and probably *corchorus* cultivated and used as a herb, hence, says Rauwolf

1866

C. 1866

or Edible Corchorus

CORCHORUS
olitorius.

Mallow. It began apparently to be cultivated in Egypt about the beginning of the Christian era. It is there known by an Arabic name *melokych*, a word which seems in Crete to pass into *maulchia* (Conf. DeCandolle). It will at once be seen that these Arabic names (if indeed they be Arabic) bear no relation to the vernacular synonyms given even by the Muhammadans of India (still less the Hindus) to any form of Corchorus. This fact would point to the Muhammadans not having known it by its Arabic names prior to or during their successive invasions of India, which were continued for a thousand years from the 7th century. In consequence of this long period of Muhammadan influence, India obtained the Persian and plants and animals, but there being no na forms in which they are now preserved. orus, the

JUTE.

1867

And, indeed, the paucity of vernacular names for the various forms of Corchorus is perhaps one of the most striking evidences of the knowledge of the properties of these plants being of a comparatively modern date.

C. capsularis—
— "oa-nut,—or for
— degree of im-
— d to appreciate
the spirit of caution indicated as necessary before too sweeping conclusions are derived from the accidental observations of certain writers who have asserted that both forms of the jute plant are natives of Bengal, because they are plentiful weeds in cultivated situations (Conf. with *C. capsularis*.)

Fibre.—See a further page and under Jute

Medicine.—Ainslie says that Dr. Francis Hamilton (the Buchanan-Hamilton of later writers) had brought to him, while in Behar, specimens of this plant as an herb used medicinally by the Hindus. "Fresh or dry after being toasted and reduced to ashes it is mixed with a little honey, and given daily in *pelas* (obstructions of the abdominal viscera)"

FIBRE.
1868
MEDICINE.
1869

obstructions"

Dr. K. L. Dê, CIE., says: "The dried leaves of this plant are sold in the market. A cold infusion is used as a bitter tonic, and is devoid of any stimulating property. Mr. Simon of Assam informs me that it can be safely given to patients recovering from acute dysentery to restore the appetite, and improve the strength. Six grains of the powder, combined with an equal quantity of *Curcuma longa*, has been used, in several instances, with much success, in acute dysentery. It forms a cheap domestic medicine in a Hindu household." Dr. Bidie alludes to the dried plant being used in South India as a demulcent.

Food.—Throughout India this plant is more or less cultivated as a po'-herb, although chiefly so in Eastern Bengal. The Santals have a

FOOD
1871

C. 1871

CORCHORUS
trilocularis.

The Tufted hairy Corchorus.

JUTE.

peculiar form which may prove an undescribed species; it is known to them as a useful pot-herb under a name most probably derived from hence of some importance.

DOMESTIC
1872

people of the N.-W. Provinces of the fibre, are used for making gun-powder charcoal, and are also employed in the manufacture of baskets, &c.

1873

Corchorus tridens, Linn. ; *Fl. Br. Ind.*, I., 398.

more nearly related to the next species larger and raphe-like cord more distinct with glandular hairs in tufts. *fish India* says of this species: "Generally distributed.

FIBRE
1874

Fibre.—Murray specially mentions this species as affording a cordage fibre in Sind.

1875

C. trilocularis, Linn. ; *Fl. Br. Ind.*, I., 397.

Vern.—*Kuruchunte*, BOWO ; the seeds are in the bazars sold under the name of *Rajajira*, *Kaunti*, SANS ; *Tandasser*, KAN (according to Lisboa) ; the seeds are known as *Isbund* in Sind (according to Murray)

Reference.—*Dymock, Mat. Med. W. Ind.*, 2nd Ed., 115

1876

Botanic Diagnosis.—Stems, petioles, and under-surfaces of the leaves hairy (as in *C. acutaugulus*), but upper surface often almost quite glabrous. Capsule long thin straight angled, beak straight, hairs on the fruit short ascending tufted, 3-6 spreading from a thickened gland which is often persistent on the old fruits. Seeds black, smooth irregularly square on section, obliquely and sharply truncate at both extremities, hilum large with a raphe-like cord thrown from it to the top of the seed crossing one of the angles. The writer would be disposed to unite *C. tridens* and *C. trilocularis*, and bring with these, into a section characterised by the seeds, the species *C. urticæfolius*. He can put no reliance on the presence or absence of a short style or of a spreading stigma, as he has found both these conditions on the same plant. The fruits of the species of *Corchorus* are more variable than any other part of these plants.

Habitat.—The *Flora of British India* states that this species is met with in the N.-W. Provinces, the Panjab, Sind, and south to the Nilgiri. It is native of Bengal, and flowers it is found in Gujarat, Sholapur, &c. that it appears along

FIBRE
1877
MEDICINE,
1878

"In Bombay the seeds of *C. trilocularis* are used as grains in fever and was known to the Greeks. Theophrastus says *ἀραβομαζόμενος οὐκ εἶναι πικρότητα κάρ- χοπος* (H. P., 77). Pliny (21, 32, and 25, 13) also mentions it as a poor kind of pulse growing wild." Murray states that "the plant macerated in water for a few hours yields a mucilage which is prescribed as a

C. 1878

The Commercial Fibre.

CORCHORUS.

demulcent, and the seeds as a "specific in rheumatism." (*Pl. and Drugs*, Sin3, 65)

The *Ulfag Udwiyeih*, by Noured-din Mahomed Abdulla Sherazi, uses the name of *isbund* for a species of what appears to be mustard seed.

JUTE.

JUTE.

JUTE.
1879

In connection with the reports of the Calcutta International Exhibition the writer published the greater portion of the facts which will be found

historic sketch of the subject together with certain facts of economic interest connected with the species of *Corchorus*. It may here be stated that the

Comm. and Vern. Names.—Jute, or Jew's Mallow, Eng.; *Jute, mauve des juis, corde textile*, Fr.; *Jute*, GERM.; *Pai*, BENG. Roxburgh says that "the Bengali name is *choti*, the Orissa, this Roxburgh derived Jute from that the native name is *choti*."

References.—Hem Chunder Kerr's *Report on Jute and other Fibres in Bengal*, 1877; Babu Ram Comal Sen *Treatise on Jute*, 1877, 91, Royle, *Fib Report on the Fibres by Cross*, Ind., Ed. C. B. Etc., and to the *Corchorus*

HISTORY OF THE JUTE INDUSTRY.

The history of the modern Jute industry is exceedingly interesting and intimately associated with the British rule in India. There can be no doubt that jute was known to the people of India from compa-

HISTORY.
1880

CORCHORUS
trilocularis.

The Tuftedly hairy Corchorus.

JUTE.

peculiar form which may prove an undescribed species; it is known to them as a useful pot-herb under the name of *bir-narcha* (Rev. A. Campbell), a name most probably derived from the Bengali *narcha* (*C. capsularis*), hence of some importance. Knowledge of the plant was anciently possessed by this [his *Economic Products* give the people of the N.-W. Provinces of Corchorus.

DOMESTIC
1872

removal of the fibre, are used for making gun-powder charcoal, and are also employed in the manufacture of baskets, &c.

1873

Corchorus tridens, Linn.; *Fl. Br. Ind.*, I., 398.

Botanic Diagnosis.—Much more nearly related to the next species than to *C. acutangulus*. Seed larger and raphe-like cord more distinct than in *C. trilocularis*, capsule with glandular hairs in tufts.

Habitat.—The *Flora of British India* says of this species: "Generally distributed."

FIBRE
1874

Fibre.—Murray specially mentions this species as affording a cordage fibre in Sind.

1875

C. trilocularis, Linn.; *Fl. Br. Ind.*, I., 397.

Vern.—*Kurá chunts*, BOMB; the seeds are in the bazars sold under the name of *Kija-jira*, *Kaunt*, *SANS*, *Tondassir*, *KAN* (according to Lisboa); the seeds are known as *Isbund* in Sind (according to Murray).

Reference.—*Dymock, Mat. Med. W. Ind.*, 2nd Ed., 115.

Botanic Diagnosis.—Stems, petioles, and under-surfaces of the leaves

1876

section obliquely and sharply truncate at both extremities, with the trilobed the absence of a short style or of a spreading stigma, as in the same conditions on the same plant. The fruits of the species of *Corchorus* are more variable than any other part of these plants.

Habitat.—The *Flora of British India* states that this species is met in the Deccan, Sind and south to the Nilgiri, Bengal, and flowers in Gujarát, Sholá, it appears along with oblong, lanceo-

ed" (Murray).

FIBRE
1877
MEDICINE,
1878

Medicine.—Dymock says: "In Bombay, the seeds of *C. trilocularis*, which are bitter, are administered in doses of about 80 grains in fever and obstructions of the abdominal viscera. A bitter *Corchorus* was known to the Greeks. Theophrastus says *επαραιμαζόμενος διά την κίχλην κέρχους* (H. P., 77) Pliny (21, 32, and 25, 13) also mentions it as a poor kind of pulse growing wild." Murray states that "the plant macerated in water for a few hours yields a mucilage which is prescribed as a

C. 1878

The Commercial Fibre.

CORCHORUS.

demulcent, and the seeds as a "specific in rheumatism." (*Pl. and Drugs, Sind, 65.*)

The *Ulfaz Ujwiye*, by Noured-din Mahomed Abdulla Sherazi, uses the name of *isbund* for a species of what appears to be mustard seed.

JUTE.

JUTE.

JUTE.
1879

In connection with the reports of the Calcutta International Exhibition the writer published the greater portion of the facts which will be found in the present account of the fibre obtained from the species of *Corchorus*. In a further volume the commercial aspects of jute will be given (see JUTE), while in the following pages an effort is made to present a general and historic sketch of the subject together with certain facts of economic interest connected with the species of *Corchorus*. It may here be stated that the commercial fibre Jute is obtained from either one or both of the following species of *Corchorus*, viz., *C. capsularis*, *Linn.*, grown in Northern, Cen-

Comm. and Vern. Names.—Jute, or Jew's Mallow, *ENG.*; *Jute, manne des juts, corde textile*, *FR.*; *Jute*, *GERM.*; *Pât*, *BENG.* Roxburgh says that "the Bengalis call it jute," but Royle enters into an explanation of the origin of the word, which he makes out to be a corruption of *choti*, the name of a coarse cloth formerly made from this fibre. In Orissa, this cloth was called *jhut*, *jhôto*, *jhôtô*, from which probably Roxburgh

derived the name. It is derived from *gunt*, a South Indian name for coarse sackcloth, made originally, as it would appear, from *Sunn* not from *Jute*. (See para 1793 and 1800, also *Crotalaria juncea*.)

References.—Hem Chunder Kerr's *Report on Jute and other Fibres in Bengal, 1877*; Babu Ram Comal Sen *Trans. As. Soc. Bengal*, 91, Royle, *Fibrous Plant Report on the Jute Traffic*; Fibres by Cross, Beavan, & Co. *Ind.*, Ed. C. B. C., 429, *As. Soc.*, and to the references *Corchorus*.

HISTORY OF THE JUTE INDUSTRY.

The history of the modern Jute industry is exceedingly interesting and intimately associated with the British rule in India. There can be no doubt that jute was known to the people of India from compa-

HISTORY.
1880

CORCHORUS.

The Jute Fibre

HISTORY.

ratively remote periods, but, as indicated under *C. capsularis* and *C. effloratus*, from the confusion which existed down to the present century in the words *sunn*, *pat* or *patta*, *bhanga*, and *hemp*, &c., names applied to certain Indian fibres, it is difficult to determine for certain many of the fibre-yielding plants referred to by ancient writers. The probability is that *sunn-hemp* (the fibre of *Crotalaria juncea*) was better and earlier known

and *C. capsularis*. Prior to that date the Government returns of exports from India mention *hemp* fibre; this must have been either *sunn* or *jute*, since the true hemp fibre has not been cultivated for centuries

1881

century ago, were the present day, for the importation and development of another branch of the trade, India, and Egypt, were, or the supply of grain. of rough gunnies were

greedily bought up the high price was a powerful incentive to increased activity, and thus the gunny-bag trade rapidly became a recognised part of the Bengal peasant's work. By and by, however, European machinery began to compete with manual labour, and in due time it gained the day. Jute was exported to Europe for cordage, and ultimately for the manufacture of the bags required in the grain trade. The first commercial mention of the word "jute" is in the customs returns of the exports for 1828, when 364 cwt. were sent to Europe. Soon the agriculturist found that his time would be more profitably spent in preparing an extra quantity of fibre, than in manufacturing bags to compete with steam and mechanical appliances; the preparation of fibre speedily outstripped the demand for home manufacture, and a large export trade was established in raw jute to feed the Scotch mills. Thus transferred from its original home, the gunny trade took a new start in Dundee, and down to the year 1854 little or no effort was made to improve the application of European machinery.

The "Yarn Mills Company" was established in 1854. George Ackland, a large owner of non-official member of the Legislative Council, were afterwards called the "Isheer Company, Limited" and are now known as the "Wellington Mills." Three years later (1857) the "Borneo Company, Limited," a Company originally established to exploit the Island of Borneo, founded the mills now known as the "Baranagore Jute Mills." In 1863-64 the Gouripore Jute Factory came into existence. Following these factories sprang up rapidly in every direction around Calcutta. In the Trade Returns for

C. 1881

of European Commerce.

CORCHORUS.

HISTORY.

1869-70 the exportation of manufactured jute was 6,441,863 gunny bags manufactured by power and hand looms, and brought into competition with the Dundee bags. This trade developed steadily, and in 1879-80, ten years later, over 55,908,000 gunnies were exported from India. The relative importance of the export trade in raw jute, as compared with the exports in manufactured jute of all kinds, may be seen by a careful examination of the tables (given in another volume), but the result may be summarised by saying that in 1886-87 the exports of raw jute amounted to £4,869,814, whereas for the same year the entire exports from India of power and hand loom jute manufactures amounted to only £1,149,296. This is of course a comparison between the total exports of raw jute and a portion of the Indian manufactures. In a further page the relative amount of Indian manufactured jute exported as such and the amount used up locally or devoted to the export trade in grain will be found. But speaking purely of India's foreign trade in jute and jute manufactures it would seem that even with 24 large European factories at work in India, and the hand-loom which still survive, scattered over the country, her raw jute interests are four times as valuable to India as her manufactures. A comparison between the exports of Indian "power-loom" as compared with "hand-loom" manufactures will still further show the extent to which the

peasants,
gunny ba
pared wit
exported

1882

£215,978, the latter, £197,071. There were no European factories in India in 1850, so that the market was supplied by the Indian peasant's hand loom. Steadily the exports increased, the demand for gunnies calling into existence the Dundee mills, and soon after the Indian factories. Nothing could demonstrate the development of the jute trade more than a careful examination of the exports of raw jute and manufactured jute from 1854 to 1887. During that period 24 factories, larger than the average jute factories of Europe, have come into existence, and have gradually commenced to export the raw jute to the mills at Dundee.

CULTIVATION AND PREPARATION OF THE FIBRE.

AREA AND EXTENT OF JUTE CULTIVATION—Jute is largely cultivated in the northern and eastern districts of Bengal and to a smaller extent in the central tracts of the province. In Assam it is grown in Goalpara. The area under the crop in these two provinces during 1886-87 was 1 million acres and the outturn at has from 15,000 to 16,000 acres, of fibre. It has been ascertained

that more than half the annual yield of fibre is exported to foreign countries and mainly to Great Britain and the United States of America, the proportion respectively to these countries being 73 to 17 per cent. of the total despatches from India.

The following extract from the jute forecast issued by the Agricultural Department of Bengal for 1887 shows the chief districts where the crop is grown and the approximate areas under it, the latter being in acres:—
Mymensingh 250,000, Dacca 170,000, Rungpore 162,000, Pubna 150,000,

CULTIVA-
TION.
Area.
1883

CORCHORUS.

The Jute Fibre

HISTORY.

relatively remote periods, but, as indicated under *C. capsularis* and *C. olitorius*, from the confusion which existed down to the present century in the words *sunn*, *fat* or *fatta*, *dhanga*, and *temp*, &c., names applied to certain Indian fibres, it is difficult to determine for certain many of the fibre-yielding plants referred to by ancient writers. The probability is that *sunn-temp* (the fibre of *Crotalaria juncea*) was better and earlier known to the ancient Hindus than *jute*, and that the true hemp (*Cannabis sativa*) was known to them, if not brought to India by their invading and conquering ancestors. It is almost safe to assume that in very remote times *sunn*, *fatta*, and *dhangi* were synonymous and generic terms for fibre and coarse cloth, without much regard to the plant from which the fibre was obtained. If so, about the beginning of the present century, the word *fat* became fixed and associated with the fibre of *Corchorus olitorius* and *C. capsularis*. Prior to that date the Government returns of exports from India mention *temp fibre*; this must have been either *sunn* or *jute*, since the true hemp fibre has not been cultivated for centuries at least, and modern experiments have shown that the plant is not capable

1881

turalist found remunerative. The resources of the rich plains of India, Burma, and China, and latterly of America, Australia, and Egypt, were, by the British mercantile fleet, made available for the supply of grain. Bags were required for this trade, and thousands of rough gunnies were greedily bought up. The high price obtained was a powerful incentive to increased activity, and thus the gunny-bag trade rapidly became a recognised part of the Bengal peasant's work. By and by, however, European machinery began to compete with manual labour, and in due time it gained the day. Jute was exported to Europe for cordage, and ultimately for the manufacture of the bags required in the grain trade. The first commercial mention of the word "jute" is in the customs returns of the exports for 1828, when 364 cwt. were sent to Europe. Soon the agriculturist found that his time would be more profitably spent in preparing an extra quantity of fibre, than in manufacturing bags to compete with steam and mechanical appliances; the preparation of fibre speedily outstripped the demand for home manufacture, and a large export trade was established in raw jute to feed the Scotch mills. Thus transferred from its original home, the gunny trade took a new start in Dundee, and down to the year 1854 little or no effort was made to improve the machinery of European machinery. "was established" large owner of coffee plantations in Ceylon, and non-official member of the Legislative Council of that Island: these mills were afterwards called the "Isheera Company, Limited," and are now known as the "Wellington Mills" founded the mills 1864 the Gouripore factories sprang up rapidly in every direction around Calcutta. In the Trade Returns for

C. 1881

CORCHORUS.

The Jute Fibre

HISTORY.

relatively remote periods, but, as indicated under *C. capsularis* and *C. olitorius*, from the confusion of words *sunu*, *pat* or *pattu*. In Indian fibres, it is the fibre of the *Corchorus*.

It was known to them, if not brought to India by their invading and conquering ancestors. It is almost safe to assume that in very remote times

1881

first as a luxury, and latterly as a necessity. Jute probably met this demand, and, indeed, the poorer people, little more than half a century ago, were largely clad in jute cloth of home manufacture, such as, at the present day, is used by the aboriginal tribes. The increased facilities for the importation of cheap European piece-goods checked, however, the development of the branch in India, where, it were, grain.

Bags were required for the rough gunnies were greedily bought as a powerful incentive to increased trade rapidly became a recognised part of the life of the country.

By and by, however, the demand for bags to compete with manual labour, and in due to Europe for cordage, and required in the grain trade.

The first commercial mention of the word "jute" is in the customs returns of the exports for 1828, when 364 cwt. were sent to Europe. Soon the agriculturist found that his time would be more profitably spent in preparing an extra quantity of fibre, than in manufacturing bags to compete with steam and mechanical appliances; the preparation of fibre speedily outstripped the demand for home manufacture, and a large export trade was established in raw jute to feed the Scotch mills. Thus transferred from its original home, the gunny trade took a new start in Dundee, and down to the year 1854 little or no effort was made to improve the Indian manufacture by the application of European machinery. In that year, however, the "Ishera Yarn Mills Company" was established at Ishera near Serampore by Mr. George Atkland, a large owner of coffee plantations in Ceylon, and non-official member of the Legislative Council of that Island; these mills were afterwards called the "Ishera Company, Limited," and are now known as the "Wellington Mills."

The "Wellington Mills" founded the mills 53-64 the Gouripore Jute Factory came into existence. Following these factories sprang up rapidly in every direction around Calcutta. In the Trade Returns for

C. 1881

1869-70 the exportation of manufactured jute was 6,441,863 gunny bags manufactured by power and hand looms, and brought into competition with the Dundee bags. This trade developed steadily, and in 1879-80, ten years later, over 55,908,000 gunnies were exported from India. The relative importance of the export trade in raw jute, as compared with the exports in manufactured jute of all kinds, may be seen by a careful comparison of the following figures in regard to volume, but the result may be seen by a glance at the following figures. The total exports of raw jute from India of power and hand-loom jute manufactures amounted to only £1,149,296. This is of course a comparison between the total exports of raw jute and a portion of the Indian manufactures. In a further page the relative

HISTORY.

which the jute manufactures have passed out of the hands of the Indian peasants, who alone, little more than 40 years ago, met the demand for gunny bags. This is seen very clearly when the above figures are compared with the exports of 1850-51. At that time the value of the gunnies exported was greater than that of the raw jute,—the former being £215,978, the latter, £197,071. There were no European factories in India in 1850, so that the market was supplied by the Indian peasant's hand-loom. Steadily the exports increased, the demand for gunnies calling into existence the Dundee mills, and soon after the Indian factories. Nothing could demonstrate the development of the jute trade manufactures, larger quantities, and the market, in. While continued, and on with the Dundee and other foreign manufactures.

1882

CULTIVATION AND PREPARATION OF THE FIBRE.

AREA AND EXTENT OF JUTE CULTIVATION.—Jute is largely cultivated in the northern and eastern districts of Bengal and to a smaller extent in the central tracts of the province. In Assam it is grown in Goalpara. The area under the crop in these two provinces during 1886-87 has been approximately estimated at 1½ million acres and the output at 20 million maunds. Of this area Assam has from 15,000 to 16,000 acres, with a production of 237,000 maunds of fibre. It has been ascertained that more than half the annual yield of fibre is exported to foreign countries and mainly to Great Britain and the United States of America, the proportion respectively to these countries being 73 to 17 per cent. of the total despatches from India.

CULTIVA-
TION,
Area,
1883

the Agricultural
where the crop is
bring in acres (—
), Punjab 150,000,

CORCHORUS.

The Jute Fibre.

CULTIVATION.

Tipperrah 117,000, Furrerdpoore 85,000, Rajshahye 45,000, 24 Parganas 41,000, Dinagepore 40,000, Illyra 31,000, Nuldea 20,000, Jessore 30,000, Khulna 30,000, Burceah 22,000, Howghly 10,000, Goolpara 15,000.

In other provinces, jute, though occasionally cultivated, is rarely so on account of its fibre, but to a limited extent the wild, acclimatised or culti-

Impossible
in Madras.
1884

Mac... of the jute used
by... hoped that
bela

Recent experiments have, however, been made in order to discover whether the true jute plant could be profitably grown in Southern India. Mr. Benson (in his *Saidapet Experimental Farm Manual and Guide*, page 63), gives the result, arriving at the conclusion that, unless some parts of the Northern Division be more suitable, jute cannot be grown in Madras. So in a like manner it has been tried in Bombay and Burma, with apparently the final verdict that, in these provinces, it cannot be produced at a price to compete with Bengal. The plant can be grown most successfully in Burma, but the cost of labour has proved fatal to any idea of an extensive commercial industry. In 1872-73 Mr. Hem Ohunder

... jute in Bengal and
... and that should the
... would absorb only
one-eighteenth part of the available and suitable land. The estimate

... yet, been
... Forecasts
... ions as to
... eying any

Actual area
1885

(or 13,330,734 cwt.) We thus arrive at the area as 1,233,913 acres (or the same line of reasoning the annual average for the years 1880 to 1884 would have been 1,120,160 acres, and for the period from 1876 to 1880, 861,671 acres. The year 1876 was the first in which the imports of jute into Calcutta were carefully recorded, and the above figures may therefore be accepted as indicating the expansion of the area under jute in Bengal. As confirmatory of this general conclusion, based on the pub-

* An effort has been made to correct returns in maunds into cwt. as being more likely to be understood by European readers; but where this has not been done, the result may be arrived at by the following simple rule: maunds $\times \frac{1}{10}$ cwt.

C. 1885

of European Commerce

CORCHORUS.

lished figures of imports into Calcutta and Chittagong. Mr. Finucane (Director of Bengal), in his report of 1886, reviews an influential jute merchant, Mr. F. says "This estimate gives the number of bales of raw jute of 400lb each exported year by year since 1877-78, to which Mr. Wilson adds the quantity estimated to have been consumed by the jute mills in Bengal,

CULTIVATION.

1886

tration stations, yet closely accord with the estimates above given, and afford confirmation of their substantial accuracy' The writer is responsible for the italics in the above quotation. It is desirable to draw attention to the fact that the record of the jute trade preserved by merchants bears a close approximation to that tabulated by Government from the very extensive and complicated returns of road, river, and railway traffic, the concentration in the ultimate centre thus being seen to preserve a distinct relation to the far reaching ramifications of the stream of supply. But Mr Finucane concludes his review of Mr Wilson's figures as follows — 'If the annual average of the eight years ending 1884-85 be taken into consideration, the difference between the two sets of figures is not considerable, the estimate worked out in this office from the data above described being only 3.97 per cent less than that of Mr Wilson."

Soil.—Jute seems to be capable of cultivation on almost any kind of

Soil
1887

upon submerged lands, and may be said to luxuriate in the salt impregnated soil of the Sunderbans.

Climate.—A hot, damp climate, in which there is not too much actual rain, especially in the early part of the season, is the most advantageous, in exceptionally dry seasons one frequently finds crops standing through the cold season which the cultivator did not regard as worth cutting down.

Climate
1888

Preparation of Soil.—It may be stated that, when the crop is to be raised on low lands, where there is danger of early flooding, ploughing commences earlier than upon the higher lands. The more clay in the soil, the more frequent the reparation thus commences. In March, the soil is broken and collected, dried, and burned. Weeds are

Preparation
of soil
1889

Seed.—No special attention is paid to the selection of good seeds, nor do the cultivators buy and sell their seeds. In the corner of the field a few plants are left to ripen into seed, and these are, next year, sown broadcast. The sowings, according to the position and nature of the soil, commence about the middle of March and extend to the end of June.

Seed
1890

Harvest.—The time for reaping the crop depends entirely upon the date of sowing, the season commences, with the earliest crop, about the end of June, and extends to the beginning of October.

Harvest.
1891

C. 1891

CORCHORUS

The Jute Fibre

CULTIVA-
TION.

The crop is considered to be in season whenever the flowers appear, and past season, with the fruits. The fibre from plants that have not flowered is weaker than from those in fruit, the latter is coarser and wanting in gloss, though stronger. It is late reaping that is chiefly accountable for

Crop.
1892

per acre is a little over 15 maunds, ranging as high as 30 to 36 in some districts and as low as 3, 6, or 9 in others, and it is also very dependent

in Bengal.

Retting
1893

thinking that, if the drying of the leaves by stacking does not prevent the discoloration of the fibre, the fibre itself is likely to be benefited by the process, since it is found to separate more readily from the stems, and is thereby saved from the danger of rot. In some districts the bundles of jute

mon practice seems to be. The period of retting depends upon the nature of the water, the kind of fibre, and condition of the atmosphere. It varies from two to twenty-five days. The operator has therefore to visit the tank daily, and ascertain, by means of his nail, if the fibre has begun to separate from the stem. This period must not be exceeded, otherwise the fibre becomes rotten and almost useless for commercial purposes. The bundles are made to sink in the water by placing on the top of them sods and mud. When the proper stage has been reached, the retting is rapidly completed. The cultivator, standing up to the waist in the fetid water, proceeds "to remove small portions of the bark from the ends next the roots, and, grasping them together, he strips off the whole with a little management from end to end without breaking either stem or fibre. Having brought

Extraction by
Machinery
1894

existence. It is to be feared, however, that machinery will, for some

known as *water-retting* it does not do so well. The stem, and the fresher the stem, the more easily is the bark separated.

C. 1894

of European Commerce.

CORCHORUS.

Mr. W. Cogswell, however, who is an undoubted authority on all questions connected with jute, expressed in December 1831 his opinion that a softer fibre was obtained by the old process (*vide A. H. Society's Proceedings, December 1831*).

PROPERTIES OF JUTE FIBRE.

Chemical and Microscopic.—"The fibre, as found in commerce, consists of the fibre-bundles separated from the cortical parenchyma. The bundles contain 6 to 20 fibres. The fibres are firmly coherent in the bundle, the cohesion taking the form of fusion of contiguous walls, the line of fusion being very apparent. The ultimate fibres are of the normal fusiform type, 1.5-3 mm in length. In section they are seen to be thick-walled and polygonal. **Reactions,** characteristic of the jute-allied group of fibres, are brown with iodine, deep yellow with aniline sulphate; purple with phloroglucol and hydrochloric acid; a strong affinity for the basic colouring matters. **Mercurised fibre—Microscopic features.** Concen-

PROPERTIES
OF JUTE.
1895

Mercurised.
1896

77.7, Calotropis 76.5, Abutilon 75.0 and Agave 75.8, and follows after Abroma 80.0, Rhea 80.3, Flax 81.9, Sida 83.1, Crotalaria 83.0, Marsdenia 83.3 and Girardinia (Nilgiri nettle) 89.6. Jute possesses 76.0 per cent, and is thus in point of cellulose about the eighth most valuable fibre in India. It is noteworthy that of the fibres enumerated—Abutilon, Urena, Abroma, Sida, and Jute are obtained from closely allied plants and yield very similar fibres. But of these jute is the next to the last in point of chemical merit, Sida being the first of the series. This is a fact of the greatest importance, when it is added that the experts who examined these fibres at the Colonial and Indian Exhibition pronounced Sida by a long way superior to jute, being finer in point of fibre, possess-

Cellulos.
1897

Jute contains 10.3 per cent of moisture and leaves 1.2 of ash; by hydrolysis or boiling for (a) 5 minutes, in a solution of caustic soda (1 per

Ash,
1898

finer and softer in texture. By oxidation jute gains in weight, becoming 128, being in this respect inferior to any of its allied fibres, but it is found to contain 47 per cent. of carbon having the largest amount of any recorded Indian fibre; Sida, for example, possesses 45.2, flax 43.0, and Banhina fibre only 40.7.

C. 1893

CORCHORUS.

The Jute Fibre

PROPERTIES
OF JUTE

The results of the chemical and microscopic investigation of jute, instituted by Messrs. Cross, Beavan, and King, may be briefly stated to be that much more might be made of jute than has as yet been accomplished, especially in the direction of altering chemically its properties and thus adapting it for perfectly new purposes. One sample experimented with was made to resemble tassar-silk so closely that some care was necessary in distinguishing these substances, another looked remarkably like wool.

Strength.
1899

... certainly it is less of similar properties with greater strength, as we hope to be able to show among the mallow and other nearly allied tribes of plants." This opinion has been fully confirmed above by the results of Messrs. Cross and Beavan.

the recent report of experiments with Bengal fibres issued by the Agricultural Society of

... of be forgotten that jute has been cultivated for centuries, that it is in consequence more amenable

1900

nerative returns might easily be obtained since there are various opinions as to the superiority of *Sida* over jute for the finer textile purposes. Roxburgh found in his comparative tests of the fibres of India that a "dry line" of *Corchorus capsularis* broke with a weight of 164lb and a "wet line" with the same weight, whereas *Corchorus olitorius* gave way with 113 and 125lb respectively, the wet line gaining 11lb in weight. This fact of the superiority of the fibre of *capsularis* over *olitorius* is well known in modern commerce. To compare with these results it may be mentioned that, under the same test, a "dry" and a "wet" line of sunn-hemp broke with 160lb and 247lb, respectively, the latter gaining 31lb in weight. Testing jute in another way by macerating in water for 116 days, white, tanned, and tarred lines, Roxburgh found *Corchorus olitorius* white and fresh, to break with 64lb after macerating, gave way with 40lb; *C. capsularis* 67lb and 51lb. Very little difference was observed in the tanned ropes, but the tarred seemed to preserve the strength considerably, the line fresh and tarred broke with 61lb, and after macerating for 116 days bore a weight of 62lb.

1901

The defect of jute is the difficulty to spin the lighter counts so being also the case with *commercy* and when *manila* turned the fibre is too wet, so long as it is not subjected to a damp influence, but it is rapid when damp and exposed to the atmosphere.

C. 1901

of European Commerce.

CORCHORUS.

PRICE OF CULTIVATION.

PRICE OF
CULTIVA-
TION.
1902

No trustworthy figures are available of the prime cost to the cultivators of raising and extracting a maund of jute fibre. But the following table shows the average prices for the last four years.

| Qualities | | 1879-80 | 1880-81 | 1881-82 | 1882-83 |
|------------|----------------|---------|---------|---------|---------|
| | | R a p | R a p | R a p | R a p |
| Narainganj | { Fine . . . | 5 2 9 | 5 0 3 | 4 15 10 | 3 7 6 |
| | { Medium . . . | 4 9 6 | 4 6 9 | 4 3 4 | 2 15 2 |
| | { Common . . . | 4 0 9 | 3 13 7 | 3 10 4 | 2 7 6 |
| Serajganj | { Fine . . . | 5 4 0 | 5 2 0 | 5 1 0 | 3 9 0 |
| | { Medium . . . | 4 11 0 | 4 8 0 | 4 4 0 | 3 1 0 |
| | { Common . . . | 4 2 0 | 3 15 0 | 3 12 0 | 2 9 0 |

The average prices for the last four years were as follows —

| | Bengal | | Assam | |
|-------------------|--------|------|-------|------|
| | R | a p | R | a p |
| 1883-84 | 3 | 12 0 | 4 | 0 0 |
| 1884-85 | 3 | 4 0 | 2 | 13 0 |
| 1885-86 | 3 | 4 0 | 3 | 1 0 |
| 1886-87 | 3 | 10 0 | 3 | 2 0 |

The charges per maund incurred from the time the jute is purchased from the producer to the time it is landed in Calcutta are approximately as follows —

| | Narainganj | Serajganj |
|----------------------------------|--------------|--------------|
| | R a p | R a p |
| Freight to Calcutta | 0 8 0 | 0 8 0 |
| Drumming, shipping, &c | 0 2 0 | 0 2 0 |
| Aratdari | 0 2 0 | 0 2 0 |
| Bepari's profit | 0 5 0 | 0 5 0 |
| TOTAL | 1 1 0 | 1 1 0 |

Deducting the charges just shown from the cost of the jute landed in Calcutta, will give the rates paid to the grower, thus —

| Qualities | | 1879-80 | 1880-81 | 1881-82 | 1882-83 |
|------------|----------------|---------|---------|---------|---------|
| | | R a p | R a p | R a p | R a p |
| Narainganj | { Fine . . . | 4 1 9 | 3 15 3 | 3 14 10 | 2 6 6 |
| | { Medium . . . | 3 8 6 | 3 5 9 | 3 3 4 | 1 14 2 |
| | { Common . . . | 2 15 9 | 2 12 9 | 2 9 4 | 1 6 6 |
| Serajganj | { Fine . . . | 4 3 0 | 4 1 0 | 4 0 0 | 2 8 0 |
| | { Medium . . . | 3 10 0 | 3 7 0 | 3 3 0 | 2 0 0 |
| | { Common . . . | 3 1 0 | 2 14 0 | 2 11 0 | 1 8 0 |

The prime cost to the cultivators must be something lower than the figures shown in this last statement, and assuming that the data sur-

CORCHORUS.

The Jute Fibre

PRICE OF
CULTIVA-
TION.

nished are near the truth, if not correct, they lead to the following important inferences, *vis*, (a) that the price of jute has declined considerably during the past few years, and (b) that while the profits of the middlemen have not varied, those of the growers have fallen proportionately with the fall of prices in Calcutta. The price of jute fluctuates very considerably; a good year induces an indiscriminate extension of the area which must of course be attended the following year by a fall in price,

e contraction

R8 a maund.

as a maund.

in ordinary

ten earn

season,

In the

mural Department,

"The trade statis-

tics of the year have shown that the importation of raw jute to Calcutta from all sources was practically the same as in the previous year; while the value of the exports from Chittagong was twenty-seven lakhs more than that of the previous year. It thus appears that the crop was a larger one, to the lowness of were on an average

1903

For this season a larger area than usual has been sown this season, save in limited tracts which had suffered from floods in the two previous years. The prospects of the crop were generally excellent to the end of May, when the young plants were seriously damaged by floods which accompanied the cyclone, especially in the districts of Rungpore, Rajshahye, Dinagepore, Bogra, Julpigoree, and parts of Hooghly. These localities, however, excepting Rungpore, are not of first-rate importance

at present, it may be said that t above that of last year, and, area sown is above the normal, floods in some districts will be

the same time gives a key to the House:—

| | Average whole-
sale price in 12
selected districts
in Bengal | | | Average declared
value as per
Custom House
Returns | | |
|---------|-----------------------------------------------------------------------|----|----|-------------------------------------------------------------|----|----|
| | Rs | a | p. | Rs | a | p. |
| 1877-78 | 3 | 0 | 0 | 4 | 4 | 0 |
| 1878-79 | 3 | 0 | 0 | 4 | 12 | 0 |
| 1879-80 | 4 | 0 | 0 | 4 | 10 | 0 |
| 1880-81 | 4 | 10 | 0 | 4 | 13 | 0 |
| 1881-82 | 4 | 8 | 0 | 4 | 14 | 0 |
| 1882-83 | 4 | 8 | 0 | 4 | 14 | 0 |
| 1883-84 | 3 | 8 | 0 | 4 | 1 | 0 |
| 1884-85 | 3 | 12 | 0 | 4 | 12 | 0 |
| 1885-86 | 3 | 4 | 0 | 4 | 1 | 0 |

C. 1903

of European Commerce.

CORCHORUS.

COMMERCIAL VARIETIES.

COMMERCIAL
VARIETIES,
1904

There are several well-known commercial VARIETIES of jute fibre, of order, those of importance being marked *.

1. Bakrabadi.—A beautiful soft fibre, one of the finest qualities from the Dacca district, being raised on the *churs* of the Megna river.
2. Bhatial.—A coarse strong fibre, chiefly exported to Europe for rope south
3. * * * * * chiefly in rope manufacture. It derives its name from a village near Faridpur, where there was formerly a large mart for this variety of jute. The name is given to all the jute from Backerganj and Faridpur.
4. * Desi (in commerce *Dassei*)—This is a useful and good fibre, largely used for gunnies, it is long, soft, and fine, but it has a bad colour and is pronounced "fuzzy." It is produced in the

5. * *

Deraj-

its or

marshes

(b) Charna Deswâl, or fibre from the crop grown on *churs*,

6. Jaogpurî.—A poor fibre, short, weak, and more suited for paper manufacture than for spinning. It comes from the Pubna district.
7. Karimganjî.—A fairly good fibre, very long, and of good colour. It comes from the Mymensingh district, taking its name from a small village
8. Mirganjî.—Generally an inferior fibre, the worst kind coming from Mirganj, a village on the Teesta. The fibre generally comes

9. * * *

10. * ! *

11. * *

These 11 qualities, and others of minor importance, are in commerce generally grouped under four leading classes represented by the *Seraj-ganj*, *Narainganj*, *Desi*, and *Deora*; and these, again, are classed as "Fine," "Medium," and "Common," according to the qualities of the fibres. Mr. James Duffus, in a letter addressed to the writer, says of this

1905

C. 1905

ORCHORUS.

The Jute Fibre

PRICE OF
CULTIVA-
TION.

nished are near the truth, if not correct, they lead to the following important inferences, viz., (a) that the price of jute has declined considerably during the past few years, and (b) that while the profits of the middlemen have not varied, those of the growers have fallen proportionately with the fall of prices in Calcutta. The price of jute fluctuates very con-

... extension of the area
... by a fall in price,
undue contraction
Rs 3 to Rs 8 a maund
2 annas a maund,
... ordinary
... often earn
... ing season,
... does great damage In the

On the other hand, in consequence of the years they are as much as 10 to 12 annas a day. Scarcely a season produces a bad crop. The forecast for 1887, Government of India, from all sources was practically the same as the value of the exports from Chittagong was twenty-seven lakhs mout of the previous year. It thus appears that the crop was a larger an average

1903

For this reason a large area, this season, save in limited tracts which had suffered from floods in the two previous years. The prospects of the crop were generally excellent to the end of May, when the young plants were seriously damaged by floods which accompanied the cyclone, especially in the districts of Rungpore, Rajshahje, Dinagepore, Bogra, Julpigoree, and parts of Hooghly. These localities, however, excepting Rungpore, are not of first-rate importance

... districts ... it may be said that ... of last year, and, ... above the normal, ... in some districts will be ... may be expected that ... however, depend on the beginning of August

distribution ... The following table, extracted from ... frequent reference has been made), shows the average wholesale price of jute per maund since 1876, and at the same time gives a key to the valuations returned by the Custom House:

| | Average wholesale price in 12 years (districts in Bengal) | Average declared value as per Custom House Returns |
|---------|-----------------------------------------------------------|----------------------------------------------------|
| | Rs. a. p. | Rs. a. p. |
| 1876-77 | 3 0 0 | 4 4 0 |
| 1877-78 | 3 0 0 | 4 13 0 |
| 1878-79 | 4 0 0 | 4 12 0 |
| 1879-80 | 4 10 0 | 4 13 0 |
| 1880-81 | 4 5 0 | 4 16 0 |
| 1881-82 | 4 2 0 | 4 18 0 |
| 1882-83 | 3 8 0 | 4 1 0 |
| 1883-84 | 3 12 0 | 4 12 0 |
| 1884-85 | 3 4 0 | 4 1 0 |

C. 1903

of European Commerce.

CORCHORUS.

COMMERCIAL VARIETIES.

COMMERCIAL VARIETIES.

1904

There are several well-known commercial VARIETIES of jute fibre, of which the following, arranged in the order of their commercial importance, *Serajganj, Narain-Fungipuri.* these in alphabetical order, those of importance being marked *.

1. *Bakrabad*.—A beautiful soft fibre, one of the finest qualities from the

2. or rope south

3. chiefly e near Faridpur, where there was formerly a large mart for this variety of jute. The name is given to all the jute from Backerganj and Faridpur.

4. * *Desi* (in commerce *Daussee*).—This is a useful and good fibre, largely used for gunnies, it is long, soft, and fine, but it has a bad colour and is pronounced "fuzzy." It is produced in the

5. * . . .

important variety. It comes from the neighbourhood of Serajganj, and is said to consist of two kinds or sub-varieties:—

(a) *Bilan Deswal*, or fibre from the crop grown over *bhils* or marshes

(b) *Charna Deswal*, or fibre from the crop grown on *churs*.

6. *Jangipuri*.—A poor fibre, short, weak, and more suited for paper manufacture than for spinning. It comes from the Pubna district

7. *Karimganj*.—A fairly good fibre, very long, and of good colour. It comes from the Mymensingh district, taking its name from a small village

8. *Mirganj*.—Generally an inferior fibre; the worst kind coming from Mirganj, a village on the Teesta. The fibre generally comes from the Rungpore district

9. * *Narainganj* (in commerce *Naraingunge*).—This is an excellent fibre for spinning, being long and soft. It comes from the Dacca district, and is exported to Calcutta from the Narainganj marts.

10. * *Seraiganj* (in commerce *Seraiganj*).—This is a

11. *

It receives its name on account of its coming from the northern portions of Serajganj and that neighbourhood. The following are the localities from which it is obtained: Rungpore, Goalpara, Bogra, parts of Mymensingh, Kuch Behar, and Julpaguri.

These 11 qualities, and others of minor importance, are in commerce generally grouped under four leading classes represented by the *Serajganj*, *Narainganj*, *Desi*, and *Deora*, and these, again, are classed as "Fine," "Medium," and "Common," according to the qualities of the fibres. Mr. James Duffus, in a letter addressed to the writer, says of this

1905

C. 1905

CORCHORUS.

The Jute Fibre

COMMERCIAL
VARIETIES.

subject: "Every small mart in Eastern Bengal has a jute of its own, quite as worthy of mention as many of the minor forms alluded to above." This remark has an interest beyond that of commerce, for we must either infer that this extensive series of qualities of fibre indicates distinct forms

FOREIGN
TRADE,
1906

FOREIGN TRADE IN JUTE AND JUTE MANUFACTURES.

For full particulars of this trade up to date see JUTE in another volume. The present article is intended more as a historic sketch of the jute industry in which an attempt is made to give the main facts of the cultivation of the plant, and of the Indian manufactures.

INTERNAL AND COASTING TRADE.

INTERNAL
TRADE,
1907

ade will be discussed under the
Jute" and "Home Consumption
out of place here to indicate very

made at 1,062,000 cwt., making a total of jute ship-
cwt. Colonel Conway-Gordon
9,392,813 cwt., of which 3,579,063
1,069,237 cwt. by steamers;
3,482,522 cwt. by the Eastern Bengal Railway; 148 cwt. by the South
Eastern State Railway; 356,496 cwt. by road; and 5,348 cwt. by sea.
Thus the COUNTRY BOATS head the list, carrying to the sea-board 38 1
per cent. of the total jute supply—the EASTERN BENGAL RAILWAY carrying
37.0 per cent., and the INLAND STEAMERS only 20.9 per cent. The bulk
of the jute supply comes from Serajganj on the Bhadrakaputra, viz.,

1908

and from Serajganj 602,468 cwt., while the RAILWAY from
Pangsa 242,082 cwt.,

people who make it an important part
buy, or sell the fibre, and were that
ed in conveying it from the fields
it is of importance to a far larger
number of persons than to the 50,000 who find daily employment in the

* For the purpose of allowing of comparison with the returns of foreign trade, Colonel Conway-Gordon's figures of maunds have been converted into cwt.

of European Commerce.

CORCHORUS.

European factories. But even this estimate would leave out of all consideration the indigenous hand looms that are still able to compete with steam in the production of jute cloth, bags, and cordage.

RAW JUTE.

EXPORTATION AND HOME CONSUMPTION.

The following abstract of the EXPORTS OF RAW JUTE FROM CALCUTTA will be found interesting, as showing the steady and constant increase and development of the jute trade. The mean exportations for

HOME MARKET.

EXPORTS.
1909

sent but a portion of the jute industry,—namely, the exports:—

| Up to | Average of five years, in cwt. |
|---------|--------------------------------|
| 1832-33 | 11,800 |
| 1837-38 | 67,483 |
| 1842-43 | 117,047 |
| 1847-48 | 234,005 |
| 1852-53 | 437,800 |
| 1857-58 | 710,826 |
| 1862-63 | 969,724 |
| 1867-68 | 2,628,110 |
| 1872-73 | 4,858,162 |
| 1877-78 | 5,362,267 |
| 1882-83 | 7,274,000 |

The foreign exports of raw jute were, in 1882-83, 10,348,009 cwt valued at Rs.84,69,259, since which they have declined considerably, being in 1886-87 only 8,306,708 cwt valued at Rs.86,93,146. The exports of 1882-83 were the highest on record.

The rapid, yet constant, increase in the jute trade, which the above figures show, from 364 cwt in 1828 to 10,348,009 cwt. in 1882-83 representing an increase in value from Rs620 to Rs.84,69,259 in the short period of 55 years (e.g., from £62 to £5,846,925 for exported raw jute alone) speaks volumes for the noble fleet of merchant vessels trading with our Indian ports. Mr Hem Chunder Kerr, in his valuable *Report on the Cultivation of, and Trade in, Jute in Bengal*, has laid much stress upon the Russian war in 1854-55 as a cause of the development of the jute trade of India. It doubtless was a cause, but perhaps not so important one as compared with the demand with the internal administrative reform which, by railway, road, and canal, the field of European commerce.

The figures of Indian trade show that in 1871-72, it suddenly rose to 5 years has preserved an average of about 7,274,000 cwt.

In 1882-83 Indian commercial men calculated that on an average Scotland consumed over 18,400 bales (73,600 cwt) a week. Of these Messrs Cox Brothers take 2,200, Messrs Gilroy & Sons, 750; Messrs Malcolm, Ogilvie, & Co, 650, Mr. John Sharp, 700. In England the weekly consumption is over 1,860 bales, the largest consumers being the Barrow Company, 600. In Ireland the total weekly

1910

1911

CORCHORUS.

The Jute Fibre

EXPORTS.

consumption is about 730 bales, the largest firm consuming under 300 bales a week. Thus Great Britain requires over 21,000 bales or 84,000 cwt. a week, or 4,200,000 cwt. a year to keep her existing jute factories employed. These figures, when compared with the hand-loom consumption in Bengal, show how completely the gunny trade has passed out of the hands of the Indian peasant. The entire hand-loom consumption of jute in Bengal has been returned as 2,23,000 maunds a year, but allowing 50,000 maunds more to cover imperfections, this would give an annual consumption of 195,000 cwt. The Scotch power-looms alone consume 73,600 cwt. a week, or 3,710,000 cwt. a year. Although in some respects this estimate has been disturbed, it is relatively correct for the present year 1887-88.

1912

France requires 4,000 bales a week, its largest consumer, Saint Freres, requiring 700 bales; Germany requires 2,170 a week, of which the Brunswick Jute Spinning Company consume 770 bales; Belgium requires 845 bales a week; Austria, 580, Spain, 250; Holland, 400; Norway, 100. Taking annual figures for the whole of Europe it is found that Great Britain and the Continent of Europe require 1,800,000 bales a year, or 6,428,580 cwt. It may be here stated that as merchants adopt the calendar year, and Government the financial, e.g., from April to March, considerable difficulty has been experienced in comparing the Government Statistical Tables of Exports with those kindly supplied by one or two well known jute firms in Calcutta.

1913

Comparing with the above figures the 22 Indian factories at work in India in 1882-83, which on an average consumed each 500 bales per week, or 600,000 bales a year, equivalent to 2,142,048 cwt., it would appear that to keep these factories working, about 8,571,428 cwt. of raw jute are required; and adding to this amount the quantity annually con-

Annual
Capital.
1914

sumed in these 22 factories, the total annual consumption of raw jute in India in 1882-83 would be 10,713,476 cwt., thus showing a very considerable expansion, although the exports of raw jute have declined somewhat during the past five years.

It is interesting to note that the annual consumption of raw jute in India in 1882-83 would be far from correct. This is roughly equivalent to an annual turn over of capital equal to about 12-14 millions of pounds sterling as compared with the exports in 1828 of £62.

MANUFACTURES.
1915

THE MANUFACTURES OF JUTE AND THEIR EXPORTATION FROM INDIA.

In the vicinity of Calcutta, the jute manufactures have sprung up in rapid succession. Other than Calcutta, they are also in Bombay, Cuttack, and the north-eastern provinces. The number of factories is stated in the returns at 285 lakhs, which, at the conventional exchange of 10 rupees to the pound sterling, would be £2,850,000. The others are private factories, but their capital may be put down at 30 to 40 lakhs of rupees. These 24 factories have 7,164 looms and 135,593 spin-

C. 1915

of European Commerce.

CORCHORUS.

dies, and they give employment to 29,660 men, 11,198 women, 5,113 young persons, and 3,044 children. The Madras private jute company up to the present date, there are in all employment to 49,015 persons and use re almost exclusively employed in the doing a small business in cordage, hoo cloth, or other manufactures

MANUFACTURES.

In 1879 there were in England 12 factories, in Scotland 99, in Ireland 6, in all 117 factories, with 212,676 single and 7,492 double spindles, and 11,288 looms, giving employment in all to 36,354 persons. In India there are only 24 factories, but these employ 49,015 persons

It is difficult to make a reliable comparison without the details of every individual factory. Judging from the published statistics of jute factories in Scotland during the year 1879, and comparing a fixed number of these with the Indian factories for the same year, we may, however, conclude that the Indian mill workman was inferior to the Scotch workman in the ratio of 3 to 7. That is to say, it requires 7 persons to work one loom in an Indian factory, against 3 workmen in a Scotch factory. This conclusion is arrived at by dividing the total number of persons employed in a factory by the number of its looms, and obtaining the average for all Scotch factories and the average for all Indian factories. Of course this calculation is open to the error of the Indian and English factories not manufacturing the same class of goods, but relatively it may be accepted as giving some sort of comparison.

1916

FOREIGN TRADE IN MANUFACTURES.

Foreign Trade
in Manufactures.
1917

Prior to 1857 the exports of jute manufactures from India represented hand-loom fabrics. In 1850 these were valued at £215,078, whereas the trade in raw jute was only £197,071. Fifteen years later the manufactured jute, exported to foreign countries, was valued at R18,27,983 (£182,798) and the raw jute at R75,06,690 (£750,669). In 1870-71 the exports were of manufactured jute R34,24,249 (£342,224) worth and of raw jute R2,57,75,526 (£257,755). But the revival of the raw jute trade, was at once the death of the birth of the new power-loom. Ten exports of manufactured jute were valued at R1,13,06,716 (£1,130,671), of which the hand-loom produced R2,69,553 (£26,955), and last year they were valued at R1,15,18,527 (£1,151,857), of which the hand-loom produced

market for jute goods.

LOCAL OR HOME CONSUMPTION.

Local Consumption.
1918

grain or other produce, nor those used for home purposes or sent to other parts of India. These figures do not, therefore, show the whole outturn of gunnies annually manufactured in India. In fact, from January to December 1882, 119,042,771 gunnies were actually made by power-looms, of which only 41,523,607 were exported; so that the exports were barely one-

C. 1918

CORCHORUS.

The Jute Fibre

EXPORTS.

consumption is about 730 bales, the largest firm consuming under 300 bales a week. Thus Great Britain requires over 21,000 bales or 84,000 cwt. a week, or 4,200,000 cwt. a year to keep her existing jute factories employed. These figures, when compared with the hand-loom consumption in Bengal, show how completely the gunny trade has passed out of the country. The consumption of jute in the United Kingdom in 1887-88, was 3,710,000 cwt. a year. Although in some respects this estimate has been disturbed, it is relatively correct for the present year 1887-88.

1912

France requires 4,000 bales a week, its largest consumer, Saint Freres, requiring 700 bales; Germany requires 2,170 a week, of which the Brunswick Jute Spinning Company consume 770 bales; Belgium requires 845 bales a week; Austria, 580; Spain, 250; Holland, 400; Norway, 100. Taking annual figures for the whole of Europe it is found that Great Britain and the Continent of Europe require 1,800,000 bales a year, or 6,428,580 cwt. It may be here stated that as merchants adopt the calendar year, and the Government Statistical Department compares the Government supply by one or two well known

1913

Comparing with the above figures the 22 Indian factories at work in India in 1882-83, which on an average consumed each 500 bales per week, or 600,000 bales a year, equivalent to 2,142,048 cwt., it would appear that to keep these factories working, about 8,571,428 cwt. of raw jute were required; and adding to this amount the quantity annually consumed by America, Australia, and other foreign countries,

Annual
Export.
1914

were the estimates framed for 1882-83, but in an early page it has been stated that this year's production is probably close on 20 million maunds, thus showing a very considerable expansion, although the exports of raw jute have declined somewhat during the past five years.

Looking at the exportation of raw jute, of manufactured jute, and the home (Indian) consumption known to our commercial men, the statement that the jute trade is at least represented at the present date by an annual consumption of over 15,000,000 cwt. of raw jute does not seem to be far from correct. This is roughly equivalent to an annual turn over of capital equal to about 12-14 millions of pounds sterling as compared with the exports in 1828 of £62.

THE MANUFACTURES OF JUTE AND THEIR EXPORTATION FROM INDIA.

MANUFACTURES.
1915

In the vicinity of Calcutta, the jute industry has been up in rapid success other at Cawnpore, also in Bombay in cutta. The nominal is stated in the returns at 285 lakhs, which, at the conventional exchange of 10 rupees to the pound sterling, would be £2,850,000. The others are private factories, but their capital may be put down at 30 to 40 lakhs of rupees. These 24 factories have 7,164 looms and 135,593 spin-

C. 1915

of European Commerce.

CORCHORUS.

dles, and they give employment to 29,660 men, 11,193 women, 5,113 young persons, and 3,044 children. The Madras private jute company up to the present date, there are in all employment to 49,015 persons and use re almost exclusively employed in the doing a small business in cordage,

MANUFACTURES.

In 1879 there were in England 12 factories, in Scotland 99, in Ireland 6, in all 117 factories, with 212,676 single and 7,492 double spindles, and 11,283 looms, giving employment in all to 36,354 persons. In India there are only 24 factories, but these employ 49,015 persons.

It is difficult to make a reliable comparison without the details of every individual factory. Judging from the published statistics of jute

1916

man in the ratio of 3 to 7. That is to say, it requires 7 persons to work one loom in an Indian factory, against 3 workmen in a Scotch factory. This conclusion is arrived at by dividing the total number of persons employed in a factory by the number of its looms, and obtaining the average for all Scotch factories and the average for all Indian factories. Of course this calculation is open to the error of the Indian and English factories not manufacturing the same class of goods; but relatively it may be accepted as giving some sort of comparison.

FOREIGN TRADE IN MANUFACTURES.

Foreign Trade in Manufactures.
1917

Prior to 1857 the exports of Jute manufactures from India represented hand-loom fabrics. In 1850 these were valued at £215,978, whereas the trade in raw jute was only £197,071. Fifteen years later the manufactured jute, exported to foreign countries, was valued at R18,27,983 (£182,798) and the raw jute at R75,06,690 (£750,669). In 1870-71 the exports were of manufactured jute R34,24,249 (£342,424) worth and of raw jute R2,57,75,526 (£257,755). But the revival of the raw jute trade, as also : the birth of the new power-loom. Ten exports of manufactured jute were valued at R1,13,06,716 (£1,130,671), of which the hand-loom produced R2,69,553 (£26,955), and last year they were valued at R89,220 (£ of the Indian po
In a further pa
market for jute goods,

LOCAL OR HOME CONSUMPTION.

Local Consumption.
1918

It should be carefully observed that the returns published by Government show only the exports, properly so called of bales of gunny-bags, gunny-cloth, or jute rope as such, of gunnies, &c., which annually leave grain or other produce, nor those used for parts of India. These figures do not, therefore, show the whole outturn of gunnies annually manufactured in India. In fact, from January to December 1882, 119,042,771 gunnies were actually made by power-looms, of which only 41,523,607 were exported; so that the exports were barely one-

C. 1918

CORCHORUS.

The Jute Fibre

MANUFACTURES.
Home Consumption.

1919

third of the number actually manufactured. The following table will show the relations of the home consumption to the exports more clearly:—

Statement of Home Consumption and Exports of GUNNY from 1st January to 31st December 1881.

| | | |
|----------------------------------------------------------------------|------------|--------------------|
| Burma | 13,317,366 | |
| Straits | 9,153,233 | |
| Homlay and Persian Gulf | 20,001,304 | |
| Madras and Malabar | 1,064,548 | |
| Coromandel Coast | 3,602,050 | |
| Ceylon | 177,777 | |
| Up-country by rail | 11,351,000 | |
| Used in the export trade of Calcutta | 11,548,742 | |
| Total of Home Consumption | ... | 77,519,164 |
| Australia | 11,372,397 | |
| New Zealand | 5,000,100 | |
| Cape of Good Hope | 700,308 | |
| Mauritius | 119,078 | |
| Egypt | 631,078 | |
| America | 20,354,251 | |
| Hongkong (not Messians) | 413,700 | |
| Great Britain | 510,417 | |
| Europe | 90,231 | |
| Total of Foreign Exports | ... | 41,523,607 |
| Grand Total of Home Consumption and Foreign Exports | ... | 119,042,771 |

The total number of gunny-bags brought to, and carried from, Calcutta during the past three years may be here given and alongside of these the foreign exports:—

| | 1884-85. | 1885-86 | 1886-87. |
|--------------------------------------------------------------------------------|-------------|-------------|-------------|
| Imports | 18,196,002 | 20,626,541 | 23,586,402 |
| Total Exports (to other provinces of India and to foreign countries) | 137,870,318 | 127,034,964 | 124,957,225 |
| Foreign exports only | 82,779,207 | 63,760,546 | 64,577,157 |

1920

total production of gunny-bags in Bengal was perhaps 150 millions, of which 64½ millions were sent to foreign countries and 85½ millions used up in India. This may be accepted as representing the bags employed in the home, cotton, oil seed, rice, and wheat trade, and in the export trade of India.

... 12,702,225 yards
interportal
quantity
5,267,418
in to these
ver-borne

Of European Commerce.

CORCHORUS.

Traffic of Bengal for 1887 states that 605,846 pieces were sent up-country by river "direct from the jute mills without passing the Port Commissioner's wharves." A piece of power-loom gunny is equal to 80 yards, of hand-loom, to 22 yards, so that this power-loom trade alone re-

MANUFACTURES.
Home Consumption.

tolerably clear
and cloth. It

CLASSIFICATION OF THE JUTE MANUFACTURES.

The manufactures from *jute* or *pât* may be referred to three primary sections:—

- I.—CLOTH of different qualities ranging from substitutes for silk to shirtings, curtains, carpets, and gunnies.
- II.—PAPER chiefly prepared from the "rejects" and "cuttings."
- III.—CORDAGE from the coarser and stronger qualities.

These three sections may each be referred to a number of sub-divisions, which for convenience may be arranged in two leading groups, *vis*, native and indigenous manufactures, "hand-loom," and European or "power-loom" manufactures, whether made in Europe or in India. We shall first enumerate the indigenous manufactures, since these bear on the history of the industry.

INDIGENOUS MANUFACTURES.

Indigenous Cloth.—Every homestead in Bengal has suspended from a beam in the roof of the house a large net of fine jute, called *phul*, in which the women spin the yarn. The yarn is then spun into a thread, and the thread is woven into a cloth. The cloth is then finished by a process called *phul*.

CLASSIFICATION OF MANUFACTURE.
1921

Indigenous Manufacture.
1922

Sen, in the Transactions of the Agricultural Society, describes three different modes of preparing twine. The first is by means of a reel, called a *dhera*, the second by the *takur*, and the third by the *ghurgurra*. The first is said to be used for making gunny-bags, the second for making gunny-bags, and the third for making gunny-bags.

1st. Thick cloth used for making gunny-bags. Of this there are three qualities, the best being known as *amrabati*. These correspond to the three qualities of hand-loom gunnies in commerce.

CORCHORUS.

The Jute Fibre

MANUFACTURE.
Home Consumption.

third of the number actually manufactured. The following table will show the relation of the home consumption to the exports more clearly:—

Statement of Home Consumption and Exports of GUNNIES from 1st January to 31st December 1882.

| | | |
|----------------------------------------------------------------------|------------|--------------------|
| Burma | 13,312,506 | |
| Straits | 9,153,233 | |
| Bombay and Persian Gulf | 20,011,268 | |
| Malacca and Malabar | 1,661,848 | |
| Coromandel Coast | 3,609,950 | |
| Ceylon | 177,777 | |
| Up-country by rail | 11,351,000 | |
| Used in the export trade of Calcutta | 11,844,742 | |
| Total of Home Consumption | ... | 77,819,164 |
| Australia | 11,372,387 | |
| New Zealand | 5,062,160 | |
| Cape of Good Hope | 706,303 | |
| Mauritius | 119,078 | |
| Egypt | 691,078 | |
| America | 20,334,251 | |
| Hongkong (not Hessians) | 113,700 | |
| Great Britain | 516,417 | |
| Europe | 90,234 | |
| Total of Foreign Exports | ... | 41,523,607 |
| Grand Total of Home Consumption and Foreign Exports | ... | 119,042,771 |

The total number of gunny-bags brought to, and carried from, Calcutta during the past three years may be here given and alongside of these the foreign exports:—

| | 1884-85. | 1885-86. | 1886-87. |
|--------------------------------------------------------------------------------|-------------|-------------|-------------|
| Imports | 18,196,002 | 20,626,541 | 23,586,402 |
| Total Exports (to other provinces of India and to foreign countries) | 137,870,318 | 127,084,964 | 124,957,225 |
| Foreign exports only | 82,779,207 | 63,760,546 | 64,572,157 |

1920

The difference between the total exports from Calcutta and the foreign exports approximately represents the home (Indian) consumption, although there is doubtless a balance between the total of production + imports and the exports, which would represent the Calcutta local consumption. This in 1882 was estimated to be over 11 million bags, so that last year the total production of gunny-bags in Bengal was perhaps little short of 150 millions, of which 64½ millions were sent to foreign countries and 85½ millions used up in India. This may be accepted as representing the bags employed in the home, cotton, oil-seed, rice, and wheat trade, and in the export trade of India.

But in addition to gunny-bags India exported last year 12,799,225 yards of gunny-cloth, valued at Rs. 80,741, and this exclusively of the interportal trade which amounted to 5,728,858 yards (nearly the whole of this quantity going to Bombay), making a total of 18,480,000 yards as against 25,267,418 yards in 1885-86, and 19,923,884 yards in 1884-85. But in addition to these returns of gunny-cloth conveyed by sea, the Report of the River-borne

Of European Commerce.

CORCHORUS.

Traffic of Bengal for 1887 states that 605,846 pieces were sent up-country by river "direct from the jute mills without passing the Port Commissioner's wharves." A piece of power-loom gunny is equal to 80 yards, of hand-loom, to 22 yards, so that this power-loom trade alone re-

MANUFACTURES.
Home Consumption.

marking out the
ic gunny-bags
are given in
d to convey a
tolerably clear conception of the extent of the internal trade both in bags and cloth. It may be added, however, that the bulk of the hand-loom industry is conducted in Dinagepore, Purneah, Rungpore, Julpauri, and Tipperah; Julpauri turned out last year 2,336,660 and Rungpore 1,222,410 hand-loom made bags.

CLASSIFICATION OF THE JUTE MANUFACTURES.

The manufactures from *jute* or *pât* may be referred to three primary sections:—

CLASSIFICATION OF MANUFACTURE.
1921

I.—CLOTH of different qualities ranging from substitutes for silk to shirrings, curtains, carpets, and gunnies.

II.—PAPER chiefly prepared from the "rejections" and "cuttings."

III.—CORDAGE from the coarser and stronger qualities.

These three sections may each be referred to a number of sub-divisions arranged in two leading groups, "hand-loom," and European made in Europe or in India.

We shall first enumerate the indigenous manufactures, since these bear on the history of the industry.

INDIGENOUS MANUFACTURES.

Indigenous Cloth.—Every homestead in Bengal has suspended from a beam in the roof of the verandah a few bundles of jute fibre, which, while

Indigenous Manufacture.
1922

second by the *takur*, and the third by the *glurgurra*. The first is said to be intended

1st, Thick cloth used for making gunny-bags. Of this there are three qualities, the best being known as *amrahah*. These correspond to the three qualities of hand-loom gunnies in commerce.

CORDIA
fragrantissima.

The Jute Fibre.

CLASSIFICA-
TION OF MA-
NUFACTURES.

2nd, *Fine cloth*.—This is generally known by the name of *mekli dhokrá*, and is chiefly used as a cloth to sleep on; it is often beautifully striped blue or red.

3rd, *Coarse cloth*.—This is largely used for making the sails of country boats (*gun*), and also for bags to hold large seeds or fruits.

The following are the principal districts in Bengal where indigenous jute manufactures (hand-looms) may be said to exist to any considerable extent; Dacca, 25,000; Malda, 25,000;

EUROPEAN MANUFACTURES.

European
Manufac-
tures.
1923

Cloth made of carpets, curta-
tating silk fabric
hemp; for this
sprinkled with w
tons of train oil to 100 tons of jute. Sprinkled with this the jute is left for
from 24 to 48 hours, when after being squeezed by rollers and heckled,
the fibres become beautifully soft and minutely isolated, and thereby

Dundee manufacturer experimented once more on the fibre, and the result was that he was able to show that it might be used as a substitute for hemp. From that date jute gained rapidly in public favour. It is

JUTE
WHISKY.
1924

JUTE WHISKY.

waste fibre is by means of sulphuric acid converted into sugar and the resulting product thereafter fermented and distilled.

CORDIA, Linn.; Gen. Pl., II., 838.

1925

Cordia fragrantissima, Kurz, Fl. Br. Ind., IV., 139; BORAGINACE.

Vern.—Kalamet, Kungkalamet, BURM.

References.—Kurz, For. Fl. Burm., 277; Gamble, Man. Timb., 271.

C. 1925

CORDIA
Myxa.

The Sebesten Fruit.

Pr., 169; *Sind Gaz.*, 559; *Bomb. Gaz.*, XV., 66; *XIII.*, 23. *VII.*, 42;
Ind. For., VII., 82, IX., 216; *Smith, Dic.*, 374; *Kew Off. Guide to the*
Mus. of Ec. Bot., 98.

Habitat.—A moderate-sized tree of the large
sub-Himálayan tract, from the 5 feet,
the Khásia Hills, Bengal, Bur Central,
tral, and South India.

Mr. Atkinson says it is cultivated throughout the plains; is wild
along the Himálayas, and flowers in March and April, the fruit ripening
in May to July.

GUM.

1932

DYE.

1933

Gum.—

Dye —

35, and 14

dyeing, al-

the fruit is

Fibre.—

FIBRE.

1934

ing boats; tuses are also made from it. James, in his report of Chanduka
(1847), says "that from the inner bark is obtained a fibre, from which the

MEDICINE.

1935

is. It is
used in
t gargle.
dicinally

the d

cent

a la-

color

the nut, that of *C. Myxa* cannot; on sawing through the nut a heavy dis-

FOOD.

Fruit.

1936

of which is soft and clammy.

"The fruit when ripe is eaten by the natives and also pickled * * ;
the smell of the nuts when cut is heavy and disagreeable; the taste of
the kernels is like that of filberts" (*Drury*).

In a report on Chanduka in Sind (1847), it is stated that the fruit,
which "contains a great deal of mucilage, is eaten by the natives; it is
also used in the preparation of spirituous liquors" Mr. Atkinson says
the unripe fruit is pickled, and the ripe fruit eaten raw or stewed. Dymock
mentions that the fruits were eaten during the famine of 1877-78 in the
Nasik District.

FODDER.

1937

TIMBER.

1938

Fodder.—The leaves are given to cattle as fodder. The lac insect
feeds on this plant (*Indian Forester*, VIII., 82).

Structure of the Wood.—Wood grey, moderately hard. In spite of
its softness, it is fairly strong, and seasons well, but is readily attacked
by insects. It is used for boat-building, well-curbs, gun-stocks, and agri-

C. 1938

The Sebesten Fruit.

CORDIA
Rothii.

cultural implements; in Bengal for canoes. It might be tried for tea-boxes. It makes an excellent fuel. In a report of Chanduka in Sind (1847), it is stated that "the wood is used for sword sheaths." The Santals regard the wood as specially useful for yokes, as it does not irritate.

Don 1 as cheroot
wrappe 381-82 there
occurs lion cheroot
leaves (" " Ainslie says
the wood is used to procure fire by friction. Mr. Atkinson says of the North-Western Provinces that the leaves are used as plates, and that the viscid pulp of the fruit is used as bird-lime.

DOMESTIC.
1939

Cordia obliqua, Willd.

1940

This is the larger *SPRESTERN* according to Stocks, Dymock, Birdwood, &c, *C. Myxa* being the lesser, but the vernacular names given would imply the reverse to be the case.

hnaari, BENG,
PERS, Chhōti.
Gidūri, Sind;
mekkera-chettu,

Walter Elliot gives this plant the Telugu name of *Kicha viri chettu*, and remarks that its synonym *Sishmataka* is correctly translated "phlegm-dispeller."

References.—Roxb, *Fl Ind*, Ed C B C, 198; Brandis, *For Fl*, 336,
Dals & Gibs, *Bomb Fl*,
Dymock, *Mat Med W Ind*,
Birdwood, *Bomb. Pr*, 58,

Habitat.—Found in Western India (especially Guzerat), from the

MEDICINE.
1941

"regarded as a demulcent"

Special Opinion.—"The fruit in its raw state contains a gum used beneficially in gonorrhoea" (*Asst Surgeon T N Ghose, Meerut*)

Food.—The fruit is eaten, and in the Deccan is generally known as *bhokar*. Dr. Dymock says the flowers and fruit were eaten in Khandesh during the famine of 1877-78.

FOOD.
1942

Structure of the Wood.—Very much like that of the other species. Stocks remarks that in Sind it is regarded as tough, and is in considerable demand

TIMBER.
1943C. Rothii, Böm & Schult; *Fl. Br. Ind*, IV., 138.

1944

ndui, gundi,
id; Narvilli,

, 271; Dals.

CORDIA
Myxa.

The Sebesten Fruit.

Pl., 1893 *Sind Gaz.*, 1893 *Bomb. Gaz.*, XV., 1893 *XIII.*, 23. *VII.*, 23;
Ind. For., VII., 81, IX., 116; *Smith, Dic.*, 374; *Kew Off. Guide to the*
Flora of E. Ind., 68.

..... Salt Range
..... a 5000 feet,
..... (nara), Cen-
tral, and South India.

Mr. Atkinson says it is cultivated throughout the plains: it wild
along the Himalayas, and flowers in March and April, the fruit ripening
in May to July.

GUM.

1932

DYE.

1933

FIBRE.

1934

MEDICINE.

1935

Gum.—Said to yield a gum in Rajputana.

Dye.—Dr. McCann states in his *Report on the Dyes of Bengal* (pp. 32,
35, and 143) that the green leaves of this tree are in Darjiling used in
dyeing, along with Morinda tinctoria. In the N.-W. Provinces the juice of
the fruit is used as a dye (*Atkinson, Econ. Prod., N.-W. P., V., 81*).

the dried fruit is valued on account of its mucilaginous nature and cathar-
cent properties "In large quantities it is given in bilious affections as
a laxative." "Both kinds of fruit when dry are shrivelled, and of the
colour of a dry prune." The pulp of *C. obliqua* can be separated from
the nut, that of *C. Myxa* cannot; on sawing through the nut a heavy dis-
agreeable smell is observed" (*Dymock*). The kernels are a good remedy
for ringworm. Mr. Baden Powell says the leaves are useful as an appli-

Mr. Atkinson remarks: The juice of
it is given in gripes. The bark and also

cooling, and demulcent (*O. C. Ind., 1893*).

FOOD.

Fruit.

1936

Food.—The fruit grows in clusters and consists of a drupe, the pulp
of which is soft and clammy.

"The fruit when ripe is eaten by the natives and also pickled * * *
the smell of the nuts when cut is heavy and disagreeable; the taste of
the kernels is like that of filberts" (*Drury*).

In a report on Chanduka in Sind (1847), it is stated that the fruit,
which "contains a great deal of mucilage, is eaten by the natives: it is

..... Atkinson says
..... Dymock
..... 7-78 in the

Nasik District.

FODDER.

1937

TIMBER.

1938

Fodder.—The leaves are given to cattle as fodder. The lac insect
feeds on this plant (*Indian Forester, VIII., 82*).

Structure of ".....
its softness, it is is readily attacked
by insects. It un-stocks, and agri-

C. 1938

The Sebesten Fruit.

CORDIA
Rothii.

cultural implements; in Bengal for canoes. It might be tried for tea-boxes. It makes an excellent fuel. In a report of Chanduka in Sind (1847), it is stated that "the wood is used for sword sheaths." The Santals regard the wood as specially useful for yokes, as it does not

DOMESTIC.
1939

the wood is used to procure fire by friction. Mr. Atkinson says of the North-Western Provinces that the leaves are used as plates, and that the viscid pulp of the fruit is used as bird-lime.

Cordia obliqua, Willd

1940

This is the larger *SEBESTEN* according to Stocks, Dymock, Birdwood, &c., *C. Myxa* being the lesser, but the vernacular names given would imply the reverse to be the case

HIND, *Chhoto bohnaari*, BENG, *igputan*, *sapután*, PERS, *Chhól*, *gungund*, *shiru narvili*, *gungundi*, *vargund*, GUZ, *Giduri*, SINO, *Chinna-botuku*, *chinna mekkera-chettu*, TEL, *Kottá*, MALAY, *Tano*, *tannu*, BURM

References—*Roxb*, *Fl Ind*, *Ed C B C*, 198, *Brandis*, *For Fl*, 336, *Dals & Gibs*, *Bomb Fl*, *Dymock Mat Med W Ind*, *Birdwood*, *Bomb Pr*, 58,

Habitat.—Found in Western India (especially Guzerát), from the

MEDICINE
1941

regarded as a demulcent

Special Opinion—"The fruit in its raw state contains a gum used beneficially in gonorrhoea" (*Asst Surgeon T N Ghose, Meerut*)

Food—The fruit is eaten, and in the Deccan is generally known as *bhakar*. Dr Dymock says the flowers and fruit were eaten in Khandesh during the famine of 1877-78

FOOD
1942

Structure of the Wood—Very much like that of the other species. Stocks remarks that in Sind it is regarded as tough, and is in considerable demand

TIMBER,
1943

C. Rothii, *Röm & Schult*; *Fl Br Ind*, IV, 138

1944

CORDIA
vestita.

Cordage and Ropes

Habitat.—A very common tree of the dry zones of North-West, Central, and South India; planted in Rhipsalis. Stocks says that it is sometimes to be seen in Sol gardens.

GUM.
1915

Gum.—The bark, when well dried, yields a gum which is reported to be prepared at Coimbatore. In the Bombay Government of Forests District, it is stated "often eaten by the poor and picked, as is the gum which exudes from it."

FIBRE.
1916

Fibre.—The inner bark yields a coarse grey, white fibre, which is made into ropes. Buchanan, in his "Journey through Mysore," mentions having seen ropes of the bark of the *marula* or *Cordia angustifolia*, which he found common near Srirangapatna.

MEDICINE.

Medicine.—The decoction of the bark possesses astringent properties, and is used as a gargle.

1917

FOOD.

Food.—The fruit is eaten by the poorer classes and is also pickled. In Sind...

TIMBER.

1918

1919

Structure... fuel, in Sind... Powell... carriage...

1950

Cordia vestita, Hook. f. & Th.: Fl. Bor. Ind., II., 139.

Syn.—*Guxtonia vestita* W. DC.

Vern.—*Kamli*, *Jard*, *Pa.* *Adi palinda*, *pin*, *Indi*, *chinta*, *ajanta*, *kalinda*, *kerula*, *Hind*.

References.—*Reanda*, *For. Fl.* 399; *Gamble*, *Flora*, *Timb.* 371; *Atkinson*, *Forest Prod. N.W. P.*, V., 61; *Baker*, *Forest*, *Fl. Pr.* 375.

MEDICINE.

1951

... of the sub-Himalayan tract, from the ...

... other species, and when ripe is an article of food; it is considered better than that of *C. Myxa*. Mr. Atkinson states the flowers appear in spring and the fruit ripens in ... pulp which is

TIMBER.

1952

... appearance to that of *C. Macleodii*, except that the ... occasionally interrupted; it is strong and is used for wheel and well-work.

CORDAGE AND ROPES.

1953

Many fibres are used for this purpose; in fact, the natives of India are never at a loss when in the forests to find a plant the bark of which will serve the purpose of a string or rope. The majority of such plants are more or less used locally ... in the following list have been ... two * to indicate the fibre-yielding plants ... the fibres which hold a position of commercial importance (... indicating greater importance than *):—

- * *Abroma augusta*.
- Abutilon asiaticum*.
- A. Avicennae*.
- ** *Agave americana*.
- Alnus nitida* (bridge ropes).
- Artocarpus Lakoocha*.
- Arundo Karka*.

- Bauhinia angulana*.
- B. racemosa*.
- * *B. Vahlia*.
- Bixa Orellana*.
- Boehmeria matrophylla* (fishing nets).
- ** *B. nivea*.
- Bombax malabaricum*.

C. 1953

Cordage; Corander.

CORIANDRUM
sativum.

- Borassus flabelliformis.*
Broussonetia papyrifera.
Butea frondosa.
Calamus Rotang.
 * *Calotropis gigantea* (string).
 ** *Cannabis sativa.*
Careya arborea.
Caryota urens.
Chamoceros Ritchiana.
 ** *Cocos nucifera* (coir).
 * *Corchorus*, sp. (jute).
Cordia Myxa.
C. Rothii.
Crotalaria Burhia.
 ** *C. juncea* (Sunn-hemp).
Daphne papyracea.
Debregeasia bicolor (fishing lines).
D. leucophylla
D. longifolia.
 * *Desmodium tiliaefolium.*
Dombeya umbellata.
Edgeworthia Gardneri.
Eriolæna spectabilis.
Ficus bengalensis.
 * *Gerardia heterophylla.*
Gnetum scandens (fishing nets).
 ** *Gossypium*, sp. (cotton).
Grewia asiatica.
G. oppositifolia.
 * *Hardwickia binata.*
Helicteres Isora.
 ** *Hibiscus cannabinus*
H. esculentus.
H. tiliaceus.
Holostemma Rheedel.
 * *Ischemum angustifolium* (= *Pollinia*
Laportea crenulata. eriopoda).
- Leptadenia Spartium.*
 * *Linum usitatissimum* (flax).
 * *Malachra capitata.*
Maoutia Puya (fishing nets).
Marsdenia Roylei.
M. tenacissima (fishing lines)
Melochia velutina.
Memorialis pentandra.
Moringa pterygosperma.
 ** *Musa textilis* (Manilla hemp).
Ocimum Basilicum.
Odina Wodier.
Orthanthera virginea.
Pædaria foetida.
Pandanus odoratissimus.
Parrotia jacquemontiana (bridge
Periploca aphylla. ropes)
Phoenix paludosa.
P. sylvestris.
 * *Phormium tenax.*
Pouzolzia viminea.
 * *Saccharum Munja.*
S. spontaneum
 * *Sansevieria zeylanica.*
Sarcoclamys pulcherrima.
 * *Sesbania aculeata.*
S. ægyptica.
Sida rhombifolia.
 Silk—Tasar and Eri are sometimes
 used for fishing lines
 * *Sterculia villosa.*
Thespesia Lampas.
T. populnea.
Urena lobata
Villebruna appendiculata (ropes,
 strings—fishing lines).
Yucca gloriosa (lines)

CORIANDRUM, Linn, Gen Pl, I, 926

The name of this genus comes from κόρις a bug, in allusion to the

[t 516, UMBELLIFERE.
Coriandrum sativum, Linn, Fl Br. Ind, II, 717, Wright, Ic,
 CORIANDER.

Vern.—*Dhanya* or *dhanja*, HIND, *Dhane*, BENG, *Dhanya*, *dhan* (the

CORDIA
vestita.

Cordage and Ropes

GUM
1945FIBRE.
1946MEDICINE.
1947
FOOD.
1948
TIMBER.
1949

Habitat—A small tree of the dry zones of North-West, Central, and South India; plentiful in Rhypputana. Stocks says that it is sometimes to be seen in Sind gardens.

Gum—The bark, when wounded, yields a gum which is reported to be prepared at Coimbatore. In the Bombay Gazetteer of Baroda District, it is stated "fruit eaten by the poor and pickled, as is the gum which exudes from it."

Fibre—The liber or inner bark yields a coarse grey, white bast fibre, which is made into rope. Buchanan, in his 'Journey through Mysore,' mentions the use of the bark of the *narwal* or *Cordia angustifolia* for making rope.

and is used as a gargle.

Food—The fruit is eaten by the poorer classes and is also pickled.

and is used as a gargle.

Used for fuel,
boats. Baden
making car-

riage poles. Stocks says the wood of the *lyar* is much used in Sind.

1950

Cordia vestita, Hook f. & Th.; Fl. Br. Ind., IV., 139.

Syn.—*GYNALION VESTITUM*, DC.

Vern.—*hamli*, *karak*, Po.; *ham paiman*, *pin*, *indak*, *chinta*, *anjana*, *baifula*, *berula*, Hind.

References—Brandis, *For Fl.*, 338; *Gamble*, *Man Timb.*, 271; *Atkinson*, *Econ Prod.*, N-IV P., V, 81; *Baden Powell*, *Pb Pr.*, 575.

Habitat—A small deciduous tree of the sub-Himalayan tract, from the Jhelum to the Sarda River and Oudh.

MEDICINE.
1951

Medicine—Fruit used similarly to the other species, and when ripe is an article of food, it is considered better than that of *C. Myxa*. Mr. Atkinson states the flowers appear in spring and the fruit ripens in the rains. He remarks that the fruit is full of a gelatinous pulp which is commonly eaten and considered refreshing.

TIMBER.
1952

Structure of the Wood—The wood is very similar in appearance to that of *C. Macleodii*, except that the concentric lines are occasionally interrupted; it is strong and is used for wheel and well-work.

1953

CORDAGE AND ROPES

Many fibres are used for this purpose; in fact, the natives of India are never at a loss when in the forests to find a plant the bark of which will serve the purpose of a string or rope. The majority of such plants are more or less used locally in the preparation of ropes or cords, a considerable number are of commercial importance. The following list have been placed one or the fibre yielding plants frequently used hold a position of commercial importance (* * indicating greater importance than *) —

* *Abroma augusta*.
* *Abutilon asiaticum*.
* *Avicennae*.
** *Agave americana*.
* *Alnus nitida* (bridge ropes).
* *Artocarpus Lakoocha*.
* *Arundo Karka*.

* *Bauhinia angusta*.
* *B. racemosa*.
* *B. Vahlia*.
* *Bixa Orellana*.
* *Boehmeria macrophylla* (fishing nets).
** *B. nivea*.
* *Bombax malabaricum*.

Coriander.

CORIARIA
nepalensis.

been indicated by the formula $C_{10}H_{16}O$, and is therefore isomeric with borneol. By abstraction of the elements of water (by means of phosphoric anhydride) this is converted into an oil having an offensive odour $C_{10}H_{18}$, (*Pharmacog.*, p. 330). It is found Coriander seeds to contain

§ "Coriander fruit contains at borneol, a fixed oil, is also present being submitted to distillation" (*Professor Warden, Calcutta*).

Medicine.—The medicinal properties attributed to this plant are many,—namely, carminative, refrigerant, diuretic, tonic, and aphrodisiac. The dried fruit and the volatile oil are used as an aromatic stimulant in

MEDICINE.
1956

rosebuds, cardamoms, cubebs, almonds, and a little black pepper; it is

Greeks."

with good results (*Bhagwan Dass (2nd), Assistant Surgeon, General Hospital, Rawal Pindi, Panjab*) "The roasted fruit is generally used" (*Dr Bensley, Civil Surgeon, Rajshahye*) "A strong decoction of the seeds with milk and sugar to taste, is given in cases of bleeding piles" (*O R Thomson, M D, C I E, Surgeon Major, Madras*) "Useful as aromatic, stimulant, and carminative" (*S M Shircore, Civil Surgeon, Moorshedabad*) "It is reputed as an antibilious remedy" (*T N Ghose, Assistant Surgeon, Meerut*) "Cold infusion of seeds found to be very useful in colics of children, powder of fried seeds" (*Shib Chunder Bhat-tacharya, Assistant Surgeon, In Civil Medical Charge Chanda, Central Provinces*)

Food—Eaten by the natives as a vegetable. The seeds are universally used as a condiment, and form one of the ingredients in curry.

They are also employed in confectionery, and for flavouring spirits.

FOOD
1957

CORIARIA, Linn ; Gen. Pl., I, 429.

Coriaria nepalensis, Wall., Fl. Br. Ind., II., 44, CORIARÆ.

Vern.—Masuri bears the name Shālā, baul phapharchor ru, pajerra,

References.—Brandis, For Fl., 128; Kurz, For. Fl. Burm., II., 281; Gamble, Man. Timb., 113; Stewart, Pb Pl., 39; Aitchison, Cat. Pb. and

1958

C. 1958

CORIANDRUM
sativum

Coriander.

References.—*Roxb, Fl Ind*, Ed C B C, 272; *Voigt, Hort. Sub. Cal*, 23; *Dals. & Gids., Bomb. Fl*, Supp, 41; *Stewart, Ph Pl*, 105; *Flora An-*

Batten, 279; *Spons, Encyclop*, 1420, 1808; *Balfour, Cyclop*, 831; *Treasury of Bot*, 331; *Morton, Cyclop Agri*, 545 547; *Urr, Dic Indus*, *Arts and Manuf.*, 907.

Habitat.—A cultivated plant found all over India. It seems to be sown at various seasons in the different provinces and regions of India. In Bengal it is grown during the cold season; Roxburgh says this is the

the most common, the first to be sown, and the most common. It is mixed with *upam* cotton and sown broadcast in October and ripens in January; occasionally it is grown as a garden crop from June to September, watering once a week being sufficient. The seed is about 10 to 12 lb and the outturn is about 10 to 12 lb, but is sup-

and Edgeworth says it is in a "quasi-wild state." Atkinson and several other writers allude to it as a crop met with in the North-Western Provinces, and in Kumaon it is stated to ripen in May.

in the beginning of the present century, the seed (or to be

the yield being about 15 cwt. It is grown in various other parts of the world's supply, but a large proportion of the world's supply is drawn from India. Ainslie states that in the beginning of the

The Cornus

CORNUS
macrophylla.

Corn—a term often specifically applied to *Avena sativa*, but generically given to all cultivated grasses which yield farinaceous grains, such as Wheat, Maize, Barley, Oats, &c. When ground, Corn is designated flour or meal. See *Avena* Vol I, 163r

1963

Corn-flag, see Iris

Corn-Indian, see *Zea Mays*

Corn-silk—the silky stigmata of *Zea Mays*, from which a medicinal preparation is made. See *Zea*

1964

CORNUS, Linn, *Gen Pl*, I, 950

1965

[122, CORNACEÆ

Cornus capitata, Wall, *Fl Br Ind*, Vol II, 745, Wright, Ill,

1966

Syn — *BENTHAMIA FRAGIFERA*, Linn II

Vern — *Thammal, tharbat, tharwar, thesi, bamaur, bamora*, HIND, *Tumbak, LEVCHA, Tharwar, thesi*, Pn, *Bamaurd*, KUMAON

References — *Brandis, For Fl*, 253, *Gamble, Man Timb*, 212, *Stewart, Pb Pl*, 111, *Ainslie, Mat Ind*, II, 454; O Shaughnessy, *Beng Dispens*, 375, O Shaughnessy *Beng Pharm*, 40, *Atkinson, Econ Prod*, V, 75, *Treasury of Bot*, 333

Habitat.—A small deciduous tree of the Himalaya, from the Beas to Bhutan, between 3,500 and 8,000 feet met with also in Khasia hills, where

the lower hot valleys growing along with the berberry

Food — Dr Stewart says that the ripe fruit is sweetish, and is apparently made into a preserve and eaten by the natives. It resembles a strawberry somewhat in external appearance, and ripens in October

FOOD

1967

Structure of the Wood — Whitish, with reddish brown heartwood, warps in seasoning, very hard, close grained, used only for firewood

WOOD

1968

C. macrophylla, Wall, *Fl Br Ind*, Vol II, 744

1969

Vern. — *hasir kachir haleo allian hadda haru nang kandara, kaksh kachur, kochan, kagsha ruchia* HIND, *Kandar, HAZARA, Halfo*, Pn,

amble Man Timb 212

Dispens 375, O Shaughnessy, *Pb Pr*, 575 *Atkinson*,

ECON & IND, 1, 113

Habitat.—A tree, 40 to 50 feet high, frequent in the Himalaya, from the Indus to Bhutan, between 3,000 and 8,000 feet, found by the writer in Manipur. It flowers in May and June

OIL

1970

FODDER

1971

WOOD

1972

* *Cornus florida*, alluded to as having a medicinal bark, very similar in its properties to the bark of *Melia Azadirachta*

C. 1972

Corundum or Emery Stone.

CORYDALIS
Govaniana.

far between. The finest quality of Corundum is perhaps that obtained between P... considered by... p. 20; and of the Man crystallized

...tone is also reported as occu... thern India, the localities are... salem district, Mysore State, Arcot district, Kistna and Godavari, and Hyderabad territory, and on into the Central Provinces. The uses to which Corundum is put, when powdered, are well known. The consumption in India must be considerable, though possibly it was... by... are to be found scattered throughout India. To what extent Indian... very well known, but it for which the emery... to a monopoly at one don" (See Manual of V., 46-49; Manual of Coimbatore, p. 23). Emery is said to be largely exported to Bombay (Madras Manual of Administration, II., 38; Settlement Report of Upper Godavary Dist., 42; Balfour, Cyclopadia of India, 816).

1979

CORYDALIS, Linn.; Gen. Pl., I., 55.

[Ill., t. 16, f. 2; FUMARIACEÆ.

Corydalis Govaniana, Wall; Fl. Br. Ind., Vol. I., 124; Royle,

1980

Vern.—Bhūtkiz, bhutkesi, HIND. & BENO.; Bhutakesi, SANS. (Dutt, Mat. Med. Hind.)

Some doubt seems to prevail as to the source of the *budhkes* of the drug shops. Stewart says that in the Ravi basin that name is given to the root of a *Psychotis*.

References.—Stewart, Pl. Pl., 10, 109; Pharm. Ind., 23; O'Shaughnessy, Beng. Dispens., 185; U. C. Dutt, Mat. Med. Hind., 294.

MEDICINE.
Root.
1981Corydalis.
1982and allowed to evaporate spontaneously, deposits abundant crystals of the alkali, termed *Corydalis*.root, usually sold as *ARISTOLOCHIA* root, and used chiefly as an external

C. 1982

CORUNDUM.

Emery Stone

- 1973 **Cornus oblonga**, Wall; *Fl. Br. Ind.*, II., 744.
 Vern.—Kagshi, SUTLEJ; Dab, KUNAWAR, Kazmol, bakar, ban-bakar, hald, HIND
 References—Brandis, *For. Fl.*, 253; Kurz, *For. Fl.*, I, 545; Gamble, *Man Timb.*, 212; Steuart, *Pb Pl.*, 111; O'Shaughnessy, *Beng Dispens.*, 375; O'Shaughnessy, *Beng Pharm.*, 39; Boden Powell, *Pb. Pr.*, 576.
 Habitat—A small tree of the outer Himalaya, from the Indus to Bhutan, between 3,000 and 6,000 feet, met with also in the Martaban Hills, Burma, between 4,000 and 7,000 feet (Kurz)
 Structure of the Wood.—Pinkish-white, hard, even-grained, warps and has an unpleasant scent.
- WOOD.
1974
- 1975 **C. sanguinea**, Linn; *Fl. Br. Ind.*, II., 744.
 THE DOGWOOD, DOGBERRY, or HOUNDS' TREE, a name given in consequence of a decoction of the bark having been formerly used for washing mangy dogs; sometimes also called the CORNEL TREE
 References—Brandis, *For. Fl.*, 253; Gamble, *Man Timb.*, 212; O'Shaughnessy, *Beng Dispens.*, 375; O'Shaughnessy, *Beng Pharm.*, 39; Cooke, *Oils and Oilseeds*, 38; Smith, *Dic.*, 155
 Habitat—A shrub or small tree found in Europe, Siberia, and in Kashmir, in the last-mentioned country at 7,000 feet in altitude. The writer found the plant also growing near a village in Chumba State, but it may there have been only cultivated. The young shoots are red in spring, and the leaves turn of that colour in autumn, hence the specific name given by botanists
 From the black turning in lamps
 1 cherry—Cornus
 mascula, a shrub of Europe and Northern Asia, contain an useful oil. These facts would seem to suggest that the Indian species should be more carefully examined, as they also may be found to afford oils
 Structure of the Wood.—Hard, much valued in Europe for the manufacture of small articles such as tooth-picks, butchers' skewers, &c. It is valued as affording an admirable charcoal for gunpowder
- OIL.
1976
- WOOD.
1977
- Coromandel or Calamander-Wood**, see *Diospyros quersita* and *D. hirsuta*.
- Coroxylon Griffithii**, a misprint which appears in *Balfour's Cyclopaedia* and in the writings of other authors. See *Caroxylon* and also *Haloxylon*
- Corrosive sublimate**, see *Mercury*
- 1978 **Corundum**,
 EMERY STONE, Eng., L'EMERI, Fr., SCHMERGEL, Germ., SNERIG-LIO, Ital
 Vern.—Kurund, HIND, Samada, GUJ
 This, the industrial form of the mineral, is a granular alumina, with which a small amount of magnetic iron is associated. It is very freely distributed among the crystalline rocks of Southern India, but the localities where it is sufficiently abundant for industrial work are few and
- C. 1978

Corundum or Emery Stone.

CORYDALIS
Govaniana.

far between. The finest quality of Corundum is perhaps that obtained

.. ..

..

pply is con-

G S I, V.,

In Part IV.

varieties:

c rocks of

n immense

l as occur-

calities are

.. sore State,

istna and

1979

Godavari, and Hyderabad territory, and on into the Central Provinces.

"The uses to which Corundum is put, when powdered, are well known.

The consumption in India must be considerable, though possibly it was larger formerly than it is at present, as the trade of the native armourer is

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

CORYDALIS, Linn.; Gen Pl, I, 55.

[Ill, t 16, f. 2; FUMARIACEE.

Corydalis Govaniana, Wall; Fl Br Ind, Vol. I, 124; Royle,

1980

Vern—*Bhutkis, bhutkesi*, HIND & BENO, *Bhutakesi*, SANS (Dutt, Mat Med Hind)

Some doubt seems to prevail as to the source of the *bhutkes* of the drug shops. Stewart says that in the Kavi basin that name is given to the root of a *Ptychotis*.

References.—Stewart, *Pb Pl*, 10, 109 *Pharm Ind*, 23, O'Shaughnessy, *Beng Dispens*, 185; U C Dutt, *Mat Med Hind*, 294

Habitat—A small herbaceous plant, found in the North-West Hima-

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

.. ..

MEDICINE.
Root.

1981

Corydalla,
1982

and allowed to evaporate spontaneously, deposits abundant crystals of the alkali, termed *Corydalia*."

h it

the

rich

even

in solution to dogs without inconvenience."

"The *Corydalis tuberosa* and *fabacea* in Europe have a bitter acid root, usually sold as *ARISTOLOCHIA* root, and used chiefly as an external

C. 1982

CORYLUS
Avellana.

The European Hazel.

1983

application to indolent tumors. The small quantity in our possession alone prevented the *Corydalis* and its salts from being extensively tried in the treatment of ague. The chemical properties of the salts are closely analogous to those of morphia and anarcotine; an interesting fact, as it strengthens the resemblance already detected by botanists between the *PARIVRACERÆ* and *LUMBARÆ*." It might be added also that the relation of these orders to the *RANUNCULACEÆ*, through *Coptis* and to *BERBERIDACEÆ* through the berberry or *rasant* extract, is similarly borne out by their chemical and medicinal properties. (See the next species and compare with the remarks under *Coptis Teeta*, C. No 1789, and *Berberis Lycium*, B. No. 460; also *Picrorhiza Kurooa*).

The Turkey-corn or Turkey-pea (*Corydalis formosa*) contains in its roots, according to Mr. W. T. Wertzell, the alkaloid *corydaline*, formic acid, bitter extractive, an acrid resin with volatile oil, a tasteless resin,

MEDICINE.
1984

the alkaloid (*Corydaline*) found in the European species—*Corydalis tuberosus*.

The roots of all these plants are supposed to be tonic, diuretic, and alterative, and are prescribed in syphilitic, scrofulous, and cutaneous affections, in the dose of from 10 to 30 grains. The drug is also often used in the form of a decoction or tincture.

Corydalis ramosa, Wall, Fl. Br. Ind., I., 125.

Dr. Alitchison, in his *Flora of the Kuram Valley* (Linnean Soc. Jour, XIX, page 145), says that in Kuram this common Himálayan scrambling annual is employed medicinally by the natives in the treatment of eye diseases, like all other plants with yellow sap. It is there called *mamirán*. It would be interesting to know if this plant is used medicinally in other

CORYLUS, Tourn. ; Gen. Pl., III., 406.

1985

Corylus Avellana, Linn. ; CUPULIFERÆ

THE EUROPEAN HAZEL.

Vern.—*Findak, bindak*, HIND, PERS ; *Chalgosa*, PERS

References.—*Brandis, For Fl.* 494; *Gamble, Man Timb.* 390; *O Shaughnessy, Beng. Dispens.* 609; *U. S. Dispens.* 15th Ed., 977; *Baden Powell, Pb Pr.* 268, 335.

Habitat—Found in England, France, and eastward to the Caucasus and in Asia Minor. Alluded to by some authors as cultivated on the

MEDICINE.
Nuts.
1986
FOOD.
Nuts.
1987

tonic,
in the
Central

India are probably all obtained from the

C. 1987

MEDICINE.
1984

the alkaloid (*Corydalin*) found in the European species *Corydalis tuberosa*.

The roots of all these plants are supposed to be tonic, diuretic, and alterative, and are prescribed in syphilitic, scrofulous, and cutaneous affections, in the dose of from 10 to 30 grains. The drug is also often used in the form of a decoction or tincture.

Corydalis ramosa, Wall; Fl. Br. Ind., J., 125.

Or. Aitchison, in his *Flora of the Kuram Valley* (Linnean Soc. Jour., 1877), says it is a common Himalayan scrambling plant, and in the treatment of eye is there called *mamiran*.

CORYLUS, Tourn.; Gen. Pl., III., 406.

1985

Corylus Avellana, Linn.; CUPULIFERÆ.

THE EUROPEAN HAZEL.

Vern.—*Findak*, *bindak*, HINDU.; *Chalgosa*, PERS.

References.—*Brandis, For. Fl.*, 421; *Gamble, Man. Timb.*, 370; *O'Shaughnessy, Beng. Dispens.*, 609; *U. S. Dispens.*, 15th Ed., 977; *Bailey Powell, Pb. Pr.*, 258, 335.

MEDICINE.
Nuts.
1986
FOOD.
Nuts.
1987

... .. to the Caucasus
... .. on the
... .. probable
... .. or semi-

... .. is tonic,
... .. I in the
Food.—ENGLISH HAZEL NUTS are much
sea-port towns. Those carried into the towns of Upper and Central
India are probably all obtained from the next species.

C. 1987

The Fan Palm of South India.

CORYPHA
umbraculifera.

Corylus Colurna, Linn.

1988

Syn—C. LACERA, Wall

Habitat.—A moderate sized tree of the North-West Himalaya, between 5,500 and 10,000 feet. The flowers appear in March and April, and the fruit ripens in the rains. "The trees bear every third year, and yield a crop sufficient for export to the plains" (Atkinson).

Oil.—There seems no reason to doubt but that an oil could be prepared from this species of hazel as well as from the European nut. No mention is, however, made of the natives of India extracting oil from it, although the plant is frequently abundant in the temperate forests, so

OIL.
1989

nuts
-sellers' shops, being

MEDICINE.

Nuts
1990
FOOD
Nuts.
1991

Food.—The nuts are smaller than the European variety, but are nearly as good, and are largely eaten, being exported from the various hill stations in the Himalaya. The hazel nuts from Afghanistan and Kashmir are much more like the European nut, and are recognised by the natives of the plains as distinct from the Himalayan form. It is thus probable that they are either obtained from *C. Avellana* or from a cultivated superior stock of *C. Colurna*. As seen in the forests in the Simla district, the actual nuts are small and rarely mature their kernels, but they are encased in a large coarse outer coat and form large succulent heads.

Structure of the Wood.—Pinkish-white, moderately hard. It is only warp, and deserves to be
a fine shining grain

WOOD.
1992

C. ferox, Wall; Gamble, Man Timb, 390

Vern.—Curri, NEPAL, Langura, BHUTIA

Habitat.—A small tree of Nepal and Sikkim, 8,000 to 10,000 feet.

Food.—The fruit is covered with a prickly cup, the kernel is edible

Structure of the Wood.—Pinkish white, moderately hard, even-grained.

FOOD.
Nuts.
1993
WOOD.
1994

CORYPHA, Linn, Gen. Pl., III., 922

Corypha umbraculifera, Linn, PALME

1995

THE TALIPOT PALM OF CEYLON AND THE FAN-PALM OF SOUTH INDIA.

Vern.—

panai,

Bajar

BURM.

References.—Roxb, Fl. Ind., Ed. C.B.C., 398-399; Vahl, Hort. Sub
Cal., 640, Brandis, For. Fl., 549; Kuhn, For. Fl. Burm., II., 521;
Thwaites, En. Ceylon Fl., 319, Dals. & Gibs, Bomb. Fl., Suppl., 944
Rheed, Mal., III., t. 1-12; Rumph., II., 174, t. 6; Sir Walter

C. 1995

CORYPHA
umbraculifera.

The Fan-Palm of South India.

Willot, *Flora Andhraea*, 169; *Malabar, Man. Admin.*, 27; *Madras Sheriff, Suppl. Pharm. Ind.*, 116; *Drury, U. Pl.*, 159; *Royle, Fib. Pl.*, 68; *Kew Off. Guide to the Mus. of Ec. Bot.*, 71; *Kew Off. Guide to Bot. Gardens and Arboretum*, 31.

Habitat.—A large tree of Ceylon and the Malabar Coast; cultivated in Bengal and Burma. But Roxburgh says it is "a native of Bengal, though scarce in the vicinity of Calcutta. Flowering time, the beginning of the hot season. The seeds ripen about nine or ten months afterwards." Reported to be very common in the moist regions of the Madras Presidency. This tall and handsome tree, Sir E. Tennet says, *are large as the fan palm of the same name, and the leaves are much larger than those of the fan palm.*

FIBRE.
Leaves.
1996

Fibre.—The leaves are made into fans, mats, and umbrellas, and are used for writing on. They are also largely employed for thatching. Knox, a writer quoted by Royle, says: "Of this, the leaf, being dried, is very strong and limber, and most wonderfully made for man's convenience to carry *along with them for use as a fan, or for thatching, or for writing on.*"

Fibre-bundle.
1997

to be strong and durable." It seems probable that, after removing the *vascular cords might* extracted from the reported to be softer and more pliable than those found at the bases of the leaves. Drury states that "the leaves alone are converted by the Singhalese to purposes of utility. *uses, and portable tents of a rude* interesting use to which they are books and ordinary purposes. term applied to them when so

Paper (ofas).
1998

employed, the leaves are taken whilst tender, and after separating the central ribs, they are cut into strips and boiled in spring-water. They are dried first in the shade and afterwards in the sun, then made into rolls and kept in store, or sent to the market for sale. Before they are fit for writing on they are subjected to a second process. A smooth plank of areca palm is tied horizontally between two trees; each *ofa* is then damped, drawn back-wards an face becomes perfectly the moisture dries up, mplete. The smoothing of a single *ofa* will occupy from 15 to 20 minutes." The writer cannot discover any description of the preparation of the palm leaves as adopted in India, and in the case of the Palmyra palm (see B. 719), oil is employed to give the polish. The whole subject of these prepared slips of palm leaves is worthy of more attention, since they are coming into European commerce in the manufacture of ornamental braids and in the construction of straw or Leghorn hats.

Braids.
1999
Hats.
2000
FOOD.
Sago.
2001

Food.—A kind of sago is yielded by the pith. Little information of a definite kind can be discovered as to the extent in which this starch is used in India as an article of food, nor as to the methods adopted in its

Sago Palm; the *Coscini***COSCINIUM
fenestratum.**

preparation Knox says of Ceylon that the people "beat it in mortars to flour, and bake cakes of it, which taste much like white bread, it serves them instead of corn before their harvest is ripe"

Structure of the Wood—Soft, with a hard rind composed of black vascular bundles. The vascular bundles in the centre of the stem are soft Roxburgh remarks "I do not find that the wood is put to any useful purpose"

The tree often grows to a great size before flowering; one whose measurements were given in the *Indian Agriculturist* for November 1873 as flowering at Peradeniya, Ceylon, measured: height of stem 84 feet, of flower panicle 21 feet, total 105 feet, girth at 3 feet from the ground round the persistent bases of the leaves 13 feet 9 inches, at 21 feet from the ground 8 feet 3 inches, age about 40 years The leaves are very large, often 10 to 16 feet in diameter

WOOD
2002DOMESTIC
Beads
2003

A considerable trade is done in these nuts from Bombay, the supply coming apparently from North Kanara and Ceylon They are sold at Rs20 to Rs25 per candy of 616lb They are also sometimes coloured red and sold as coral, or are made into small bowls and other ornaments In Europe they are now largely employed in the manufacture of buttons The trade in these nuts is chiefly carried on by Arabs

Ornaments.

2004

Buttons

2005

2006

Corypha Talera, Roxb ; *Cor. Pl.*, 1 255

A closely allied species to the preceding, which bears most of the vernacular names given above, and is put to the same industrial purposes, is a native of the north-eastern coast of Madras, especially in Coroman del A third species may here be mentioned by name *C. elata*, Roxb, *Fl Ind.*, 208, a stately palm and native of Bengal, where it is known as *bajâr*, but Roxburgh views *C. umbraculifera* as the intermediate form between *Tallera* and *elata*, so that even if future botanists continue to view all three as distinct species, for industrial purposes, they may be regarded as but forms of one plant. It would, indeed, be impossible to separate under these plants the various properties assigned to them

COSCINIUM, Colebr., *Gen Pl.*, I, 35

[MENISPERMACEÆ

Coscini *fenestratum*, Colebrooke, *Fl Br Ind.*, Vol I, 99.

2007

Vern—*Yhâr kî haldî* or *yhârî haldî*, Dec., *Haldî gach*, BENG., *Marâ manjal*, IAM.; *Mânu pasupu* TEL., *Marada orishna*, KAN., *Darai* (Ainslie), *daru-harsdrakam* (Moodeen Sheriff) SANS., *Venivel*, SING.
References—Voigt, *Hort Sub Cal.*, 332, *Thwaites*, *En Ceylon Pl.*, 12, *Pharm Ind.*, 10 Ainslie, *Mat Ind.*, II, 451; Moodeen Sheriff, *Suppl Pharm Ind.*, 116 *Materia Medica of Madras*, II, 11—*to* *to* *to*

Habitat.—An extensive climber, met with in the forests of the Western Peninsula, and distributed to Ceylon and the Straits

COSCINIUM
fenestratum.
The Coscium.
DIE
2008

Dye—In *Dr. U. C. Dut's Materia Medica of the Hindus, Darvi* is given as the Sanskrit for *Berberis*, sp. Neither Brandis nor Gamble record that name, nor an
 nor is it so given
 hand, gives *Dar*

Coscium and *Berberis* yield a yellow dye; are valuable medicines; and the chips of the wood, but for structural peculiarities, could not be distinguished. Ainslie apparently was labouring under one mistake; he took the *Maramanjat*, Tam, as different from the *Vinivel-getta*, Ceylon specimens of which were sent to Roxburgh for identification. General Macdowall viewed the Ceylon specimens of this species as *Colomba* root, but Roxburgh corrected him. Speaking of *Maramanjat* Ainslie says, "it is sometimes used as a yellow dye," but this was apparently unknown to Roxburgh.

Dr. Bidie remarks; "This wood contains much colouring matter, akin in properties to that of turmeric," hence the name *J-r-ki-haldi* or the properties
 author says of
 ted from Kola-
 follows; "The

MEDICINE
Root
2009

circumference, employed in preparing certain cooling liniments for the head, and is also used as a yellow dye; it is brought from the mountains, but I have endeavoured in vain to ascertain the plant" At present the root is extensively used in the hospitals of the Madras Presidency as an efficient bitter tonic. A writer quoted by Christie says of Ceylon that this root is viewed as "a very good substitute for *Calumba* I have used it

the doses
aristata.
 The drug is sometimes sold as *calumba* root or for *berberry*, from which it may easily enough be
 the wood Bright, greenish ye
 concentric rings, but having ;

2010
2011

translation of many of the
 is also stomachic" (*Surgeon-
 dras*) "Used also in cases
 of suppression of *urine* (*Surgeon-Major J. F. L. Ratton, M.D., M.C.*

COSCINIUM
fenestratum
The Coscinum.
DYE
2008

Dye—In *Dr. U. C. Dutt's Materia Medica of the Hindus*, *Darui* is given as the Sanskrit for *Berberis*, sp. Neither Brandis nor Gamble record that name, nor any apparent derivatives from it to the species of *Berberis*, nor is it so given apparently by any other author. Ainslie, on the other hand, gives *Darui* as the Sanskrit for *Coscinum fenestratum*. Both *Coscinum* and *Berberis* yield a yellow dye; are valuable medicines; and the chips of the wood, but for structural peculiarities, could not be distinguished. Ainslie apparently was labouring under one mistake; he took the *Maramanjai*, I am, as different from the *Vinivel-getta*, Ceylon specimens of which were sent to Roxburgh for identification. General this species as *Colomba root*, *Mara-manjai* Ainslie says, this was apparently unknown

to Roxburgh.

Dr. Bidie remarks: "This wood contains much colouring matter, akin in properties to that of turmeric," hence the name *r-ki-haldi* or *ghach haldi*. Dr. McGann, and also of this dye as closely resembling to the Chittagong district that the bark dyed in Arracan. The use of this dye-bark should be scraped so as to clean it. It is then broken up and steeped

also be combined with turmeric and other dyo-stuffs.

Medicine.—Ainslie says: "*Mara-manjai* is the Tamil name of a round, yellow-coloured, bitterish root, common in the bazar, about one inch in circumference, employed in preparing certain cooling liniments for the head, and is also used as a yellow dye; it is brought from the mountains, but I have endeavoured in vain to ascertain the plant." At present the

Presidency as an Ceylon that this I have used it has also anti-essing wounds *tertia Medica* of e author with,

that it may the doses aristata.

The drug is sometimes sold as *calumba root* or for *berberry*, which it may easily enough be distinguished by the peculiar structure of the wood. Bright, greenish yellow, with open porous structure, devoid of concentric rings, but having pronounced medullary rays. It is, besides,

on to believe that it of the *berberry*. It is sometimes mentioned in the drug sales of Europe as *False Calumba* or *Tree Turmeric*, the latter being literally a translation of many of the vernacular names of the plant.

"It is also stomachic" (*Surgeon-Madras*) "Used also in cases J. J. L. Rattan, M.D., M.C."

The Costus.

COSTUS
speciosus.

Salem) "This has been in use for some years in the hospital and found to be a fairly useful medicine in certain cases of dyspepsia. I think it a fairly good substitute for calumba. It has been used in the form of powder and infusion. Preparations, &c.—The same as calumba." (*Apothecary J. G. Ashworth, In Medical charge, Kumbakonam*)

Trade—The root is sold in Madras at $\text{Rs } 1\frac{1}{2}$ per maund, and retailed at 2 annas a pound. There are no foreign exports of the root from India but it may be had in every large bazar throughout the country, so that there must be a considerable local demand.

TRADE.
2012

Cosmetic Bark, see *Murraya exotica*, Linn.

COSTUS, Linn.; *Gen Pl.*, III., 646.

Costus arabicus, see *Saussurea Lappa* and *hypoleuca*; **COMPOSITÆ**

C. speciosus, Sm; *Wight, Ic.*, 2014; **SCITANINÆÆ**.

2013

COSTUS
speciosus

The Costus.

desirable to leave the available information in its present form, since it is by no means established that *Costus speciosus* is not used as a substitute for *Saussurea*.

6 "Plaque's remarks must apply to *Saussurea* (not to *Costus*), not to roots are quite insi-

2015

MEDICINE.
Tubers.
2016

Medicine.—The *Costus* or *lust* root is given as a depurative and aphrodisiac. But whether or not the *lust* root should be always viewed as *Saussurea* there seems no doubt but that a certain amount of the

root a strengthening tonic is made, and it is also used as an anthelmintic."

The Rev. A. Cunningham writes, "The *Costus* for

"pain is"

writer an

alluded to

root is d

attribute

tions."

the gene

of the dri

for some unexplainable reason the roots of these plants have been con-

no resemblance

ime time there

used, and not

from any idea of adulteration with the supposed *Costus* of the ancients.

Sir Walter Elliot gives several Sanskrit synonyms for *Costus* spe-

speciosus. He may have been mistaken as to these synonyms, but he clearly

recognised what the *Costus speciosus* of botanists meant, as he describes

the plant. He refers to *Roxburgh's Flora Indica*, Vol. I, p. 50, and to

the Coromandel plants, page 126, and states that while Roxburgh in

these

"in"

whic

Pat.

(*W*)

to C

for t

from Kashmir the confusion between *Costus* and *Saussurea* might be re-

garded as rendered doubly perplexing. Irvine, in his *Materia Medica* of

Patna, says of what he calls *Costus arabicus* that it "differs wholly from

the real *Kut* or *Patchuk*" He adds that it is the root of a plant found

near water and is (sic) used in massalas, inodorous, and tasteless." Here

there seems no reason to doubt we have an allusion to *Costus* and not to

Saussurea.

Food.—The tuber is cooked in syrup and made into preserve in some

parts of India; the natives consider it wholesome. This information

regarding India was first published by Roxburgh, but Ainslie drew

attention to the fact that in *Brown's Hortus Jamaic.*, Vol. II, p. 281,

FOOD.

Tubers.

2017

Sweetmeats

2018

C. 2018

Cotula or Babuna: Alpine Stocks

COTULA
anthemoides.

the root stock is said to be used as substitute for ginger Dr Dymock, commenting on this statement, remarks: "The rhizome resembles the great Galangal in growth and structure, but has no aromatic properties, the taste being mucilaginous and feebly astringent; it could only be used as substitute for ginger by being preserved with a quantity of that root sufficient to flavour it" The Revd A. Campbell says the root is eaten by the Santals

COTONEASTER, *Medit. Gen Pl, I, 627*

[ROSACEÆ

Cotoneaster acuminata, *Lindl, Fl Br Ind, Vol II, 385.*

2019

Vern.—*Rid, rānz, rinz, rinish, Hind*References—*Brandis, For Fl, 209, Gamble, Man Timb, 171.*

Habitat.—A deciduous shrub of the Himalaya, from the Beas to Sikkim, and occurring between 4,500 and 13,000 feet

Structure of the Wood.—Hard, like that of *C. bacillaris*, used for walking sticks.

WOOD
2020*C. bacillaris, Wall, Fl Br Ind, Vol II, 384*

2021

Vern.—*Ri, rid, lin, linn, lhan, lhdra, lant, rāu, redsh, reds, rish, siché, kheroa, kheraba, l'd Hills; Ruinsh, JAUNSAIR DAWUR, Siché, Jalidar, SALT RANGE, KAUNSI, KANGRA; Aharné, PASHTU*

References—*Brandis, For Fl, 208, Gamble, Man Timb, 171, Stewart, Pb Pl, 79; Indian Forester, 1855, XI, p 3, Kangra Gas, 30*

Habitat.—A small deciduous tree of the Salt Range, above 1,500 feet, of the North-West Himalaya from the Indus to the Sarda, between 5,000 and 10,000 feet, and of Sikkim and Bhutan

Structure of the Wood.—White, turning light-red towards the centre, smooth, very hard, close and even grained, but splits and warps much. Used for making walking-sticks, the "Alpen stocks" sold at Simla are usually made of this wood, and there is a considerable trade done in exporting it to the plains from many points along the Himalaya. This is the *Cotoneaster obtusa* alluded to in the Settlement Report of the Simla district, in which it is said the hill tribes use the sticks as goads (*chunta*). The larger pieces are made into jampan poles, axe handles, &c. Baden Powell suggests that it is suitable for turning

WOOD,
2022*C. microphylla, Wall, Fl Br Ind, II, 385*

2023

the fruit is also sweet

Fruit
2024

Cotton and Cotton Manufactures, see the article *Gossypium* in Vol III

COTULA, *Linn, Gen Pl, II, 428.*

2025

*Cotula anthemoides, Linn, Fl Br Ind, III, 316, COMPOSITÆ*Vern.—*Babuna, PB HIND*

C. 2025

CRAMBE
cordifolia

The Cow Tree

MEDICINE.
Flowers.
2026

... the Gangetic plain, from
 ... babūna, which is heated
 &c. Compare with An-
 ... most diseases of the eye

Country Borage, see *Coleus aromaticus*, Benth.; LABIATÆ.Cotyledon laciniata, Roxb.; see *Kalanchoe laciniata*, DC.

COUSINIA, Cass.; Gen. Pl., II., 467.

2027

Cousinia minuta, Boiss.; Fl. Br. Ind., 359; COMPOSITÆ.

Syn.—*C. CALCITRAPHIFORMIS*, Jaub & Spach.; *C. AVALENSIS*, Bunge.Vern.—*Lakhtes*, *poli kandiari*, or *kandiari*, Pb.

Reference.—Stewart, Pb. Pl., 125.

Habitat.—A small rigid herb, found in a wild state in some parts of the Western Panjāb plains, and distributed to Afghanistan, Baluchistan, and Persia.

FOOD.
2028

Food.—The young plant is used as a vegetable in the Salt range (Stewart).

Covellia glomerata, see *Ficus glomerata*, Roxb.; URTICACÆ.Cow-itch or Cowhage, see *Mucuna pruriens*, DC.; LEGUMINOSÆ.Cowrie, Kawrie or Cowdie Pine, commercial name for *Dammara australis*, see under Dammar, Hopea, and also *Canarium*, C. 273.

Cowrie or Cowry, see Shells, also Beads, B. 380.

2029

Cow Tree ... the name of Cow Tree

first to draw special attention. It is a member of the breadfruit family (Artocarpæ). Several fruitless efforts have been made to introduce this plant into India, see the *Indian Forester*, IX., 517.

Crab's Eye, see *Melia Azedarach*; also *Abrus precatorius*, A. 73.Crab Tree, see *Pyrus Malus*, Linn.; ROSACÆ.

Crabs, see Crustacea.

CRAMBE, Linn.; Gen. Pl., I., 98.

2030

Crambe cordifolia, Stev.; Fl. Br. Ind., I., 165; CRUCIFERÆ.

Habitat.—A tall herbaceous annual, with leaves nearly a foot in diameter. Frequent in the North-West Himalāya, Quetta, Western ...

FOOD
2031

eaten as a pot-herb

C. 2031

Hawthorne: The Bel Fruit of some Writers.

CRATÆVA
religiosa.

CRATÆGUS, Linn.; *Gen. Pl.*, I, 626.

Crataegus Clarkei, Hook. f : *Fl. Br. Ind.*, II, 384; ROSACEÆ

2032

A species of hawthorn met with in Kashmir, which may be viewed as intermediate in type between the two following species

2033

C. crenulata, Roxb.; *Fl Br. Ind.*, Vol II., 384.

THE HIMALAYAN WHITE THORN.

Syn —C PYRACANTHA, *Persoon*; NESPILUS CRENULATA, *Don*.

Vern —Gingaru, gianru, HIND , Gengaru, PB.

Re Hort. Sub Cal,
Dalm & Gibs,
Drury, U. Pl.,

Habitat—A large spinescent shrub on the Himalaya, from the Sutlej to Bhután, found at altitudes from 5,000 to 8,000 feet, but in Kumáon at 2,500 feet.

Structure of the Wood—White, hard, very close and even-grained, used as axe handles, staves, &c

WOOD
2034

C. Oxycantha, Linn., Fl. Br. Ind, II, 383.

THE HAWTHORN.

Vern.—Ring, ringo, ramnia, pinyát, or pinyát, phindék, patdkhan, ban-sanjli, sur-sinjli, or sinjli, PE HIMALAYAS, Ghwansa, or ghwardan, TRANS INDUS, Durána, AFGH

Habitat.—A small tree (20-30 feet), met with in the North-West 1/4 mile or so from Ostra to the Râvi basin. Cultivated eastwards near the river, and westwards near tombs.

edible FRUIT "which is"
" (Brandis), "On the
Chenab, particularly, the fruit is large and really decent eating" (Stewart).

FOOD.
Flowers
2036
Fruit
2037
WOOD.
2038

Structure of the Wood.—Hard and durable, used for the same purposes as the preceding.

CRATÆVA, Linn ; Gen Pl, I, 110

Crataeva religiosa, Forst., Fl Br Ind., Vol I., 172; CAPPARIDEE

2030

SYN.—CAFFARIS TRIFOLIATA, Roxb ; C ROXBURGHII, Ham ; C NUR-
VALA, Ham

Veru — *Baru*, *barun*, *birdsi*, *bila*, *bitana*, **HIND**; *Barén*, *tikto-shak*, **BENG**; *Tailadu*, *bunboronda*, **MECHI**, *Purbong*, **LEPCHA**; *Darna*, *barndhi*, **PB**, **RAJ**; *Bela*, *bel*, **C. P.**; *Vdyavarnd*, *bhátavarnd*, *hddavarnd*, *kumla*, *waruna*, *karvan*, **BOMB**; *Kumla*, *karwan*, **MAR**; *Mavalangam*, *marcelinga*, *nargala*, **TAM**; *Niroddi*, *vitusi*, **KAN.**, **MAL.**; *Uskia*, *usiki*, *uski manu*, *ulimidi*, *wrimidi*, *wrumitti*, *tella ulimidi*, *tella vule*, **TEL.**; *Niruyani*, **COORO**; *Kadet*, *katat*, **BURM**; *Varuna*, *asmarrighna*, **SANS** **Roxburgh** says that it is the *Tikta-shaka* of Sanskrit writers.

History.—L. *Ægle* Marmelos
Cratæva Marr.
the same vernac
unces and in

HISTORY.

2010

C. 2040

CRATAEVA
religiosa.

Forms of Crataeva.

VARIETIES

Roxburgh, Dalzell and Gibson say it is common on the banks of the Nerbuddi; Roxburgh, that it is the tree name of the best cotton.

the latter name, as he explains, being due to the fruit having "a strong smell of garlic, which it commu-

ter-spoonful twice or thrice daily." Sir Walter Elliot alludes to this form in his *Flora Andhrica* (pp. 180, 185, 187), and gives it the Telugu names of *ulimidi*, *unka manu*, *tella-ulimidi*.

It may be worth pointing out that it is the leaves of variety *Nervala* that are mainly esteemed medicinal. as may be seen in the following list of varieties. The fruit is praised in his

day an tree of the rubefacient properties of the leaves of variety *Roxburghii*. He states, however, that in Jamaica, where that form also grows, "Braham says, the fruit is cooling, and the leaves are applied externally to take away inflammations about the anus, and also for the ear-ache." Of another Jamaica species, *C. gynandra*, he says "that the root blisters like cantharides."

These facts are of the greatest importance, in the confirmation which they afford to the opinions, expressed on a further page, by Dr. Moodeen Sheriff as to the rubefacient properties of the leaves. It would be to both forms

article on "Crataeva" in the account of *Aegle Marmelos*, and again, in the 2nd paragraph of his article on "Crataeva religiosa," refers to a resin found within the fruits, which he regards as of great value "in clearing foul ulcers." It is also used, "The resin and cement is well (around the seeds)

it is stated that with mortar to form a how many different plants as *Aegle* and

Crataeva becomes possible

Gum and Dye—"Anchison states that at Jhelum the fruit is mixed with mortar to form a strong cement, and the rind as a mordant in dyeing" (*Stewart*)

Medicine—From what has been said it may be inferred that some doubt still exists as to whether the medicinal products of *Crataeva* can be spoken of as afforded by the one species or two species. The writer must

* A name which does not appear now to be in use in Hindustan, although mentioned by the older writers

Leaves
2043
Bark
2044
Fruits
2045

Cement
2046

NORDANT
2047

MEDICINE.

The Nurvala

CRATÆVA
religiosa.

MEDICINE.
Bark
2048
Leaves,
2049

common complaint of a somewhat obscure nature. The leaf-juice is given in rheumatism in the Concan in doses of $\frac{1}{2}$ to 3 tolas, mixed with cocoa-nut juice and gñi. In caries of the bones of the nose the leaf is smoked and the smoke exhaled through the nose. The bark and the leaf

Jules.
2050
Fomentation,
2051

urinary organs" (U. C. Dutt). Irvine (*Mat Med, Patna, p 128*) says of the *barin*, *Cratæva Tapia*: "The fruit and bark are used in embrocations in rheumatism; not given internally." In the *Manual of Trichinopoly* (p 77), it is stated of "*Cratæva (nurvala) religiosa*" the "*Mari. lingai, ТАУ*," that "the leaves, bark, and roots are used medicinally." But the most complete account of the medicinal virtues of *Cratæva* will shortly appear in Dr. Moodeen Sheriff's *Materia Medica of Madras*. That author says: "The bark is sold in some large bazars of India, not the leaves and root-bark."

vesicant. The bark is also useful in some cases of urinary complaints and fever, and in some mild forms of skin diseases in which sarsaparilla is generally resorted to. It also relieves vomiting and symptoms of

use. The plant grows well with ordinary care. The fresh root-bark is also a very good rubefacient and vesicant, but it is rather too dear and not procurable in large quantities" (Moodeen Sheriff, Khan Bahadur, *Honorary Surgeon, Triplicane Dispensary, Madras*).

Food.—The fruit is said to be sometimes eaten (*C. P. Gaz.*, 59)

Structure of the Wood.—Yellowish white, when old turning light-brown, moderately hard, even-grained. Used for drums, models, writing-boards, combs, and in turnery. In Trichinopoly it is also used "for making planks and as firewood."

FOOD.
Fruit,
2052
WOOD,
2053

CRINUM
pratense.

Toxicarium—a useful Emetic.

MEDICINE
Root.
2065

for the ear-ache in Upper India. In Java, by Horsfield's account, this plant is reckoned one of the most satisfactory emetics the inhabitants have."

Extract
2066

phoretic; we have never known it to occasion any untoward symptoms. The dried sliced roots are also an efficient emetic, but require to be given in double the dose of the recent article." The extract, whether watery or alcoholic, is very uncertain in its action. In the form of a syrup it may probably be found to retain the native principles of the recent plant. The tincture of the fresh plant does not succeed, doubtless in consequence of the large quantity of spirit counteracting the emetic effect by its stimulating energy.

These two passages express all that has since appeared, as, for example, in the *Pharmacopœia of India*; Drury, Murray, K. L. De, and indeed most subsequent writers, repeat in other sentences the same facts. Dr. Dymock adds: "I have not met with any account of this drug in native works on Materia Medica."

Bulb.
2067

slightly roasted, and the juice is then expressed and a few drops poured into the ear."

The bulb of the so-called *Crinum asiaticum* is made official in the *Indian Pharmacopœia* as an emetic, nauseant, and diaphoretic.

Special Opinion.—"The bulb of *Crinum asiaticum* has a cathartic effect in cases of indigestion." (Dr. H. Anderson, M.B.)

2068

Crinum defixum, Ker. (and of Gaubl); Herbert, p. 255; Bot. Mag., [2208.

Syn.—*C. ASIATICUM*, Roxb (non Linn.), Fl. Ind., Ed. C.B.C., 253; *C. ROXBURGHII*, Dals, Fl. Bomb., 275; BELUTTA POLA TALY, Rheede, XI., t. 38; RAOIX TOXICARIA SECUNDA, Rumph., VI., 156.

Vern.—*Suk-darshan*, BENG.; Nagdown, BOMB.; *Kesar chettu*, TEL.; *Hintolabo*, SING (according to Ainslie).

References.—*Dals & Gibs*, Bomb Fl., 275; *Lisboa*, U. Pl. Bomb., 204.

Habitat.—A native of the Concan, of Coromandel, and of many parts of Bengal, as, for example, the Sunderbunds. Flowers large, sessile, white, fragrant during night; flowering time, the close of the rainy season. Dalzell and Gibson say it is common on the banks of the Deccan rivers. It delights in swampy situations where mud abounds.

MEDICINE
2069
2070

C. pratense, Herbert; Amaryll., 256.

Syn.—*C. LONGIFOLIUM*, Roxb., Fl. Ind., Ed. C.B.C., 284; *C. LAURIFOLIUM*, Herbert & Roxb.; *C. ELEGANS*, VENUSTUM, and CANALIFOLIUM, Carey.

Vern.—*Pa-lain*, BURM.

References.—*Voigt*, Hort. Sub. Cal., 590; Bot. Mag., t. 252 and 2121.

C. 2070

The Common Crocodile.

CROCODYLUS
palustris.

Habitat.—A native of the interior of Bengal, Sylhet, Pegu, &c., flowering time the rainy season. Flowers large, white, fragrant. A variable plant, some of the names given above belonging to what may prove re-

C. ' ' ' more elegant but does not
species (Roxb). The form
C. launfolium occurs in Pegu:
it has very long weak recumbent leaves (2 inches by 5 feet).

2071

Crinum, sp. (found in Chutia Nagpur.)

2072

Mr. O. B. Clarke writes of this plant that he is unable to name it, and

Vern.—Sikyom baka, SANTAL.

Habitat.—High and dry situations in Chutia Nagpur, flowering during the hot season before the leaves appear. In some respects, this resembles C. latifolium as described in Roxburgh's *Flora Indica*.

2073

Medicine.—Mr. A. Campbell says: "The bulb is sometimes as large as a good-sized turnip, and of the same shape. A decoction prepared from it is given internally and pounded and made into a paste; it is also applied externally by the Santals in dropsy. It is used for the diarrhoea of cattle."

MEDICINE.
Bulb
2074

C. zeylanicum, Linn; Wight, Ic. 2019-20

2075

Syn.—C. ORNATUM, Herbert, C. ZEYLANICUM, Roxb, C. LATIFOLIUM, Roxb, C. MOLUCCANUM, Roxb, C. HERBERTIANUM, Herb, p 213; also Wall, Pl As Rat, 2, p 145

Vern.—Sukh-darsan, BENG, Gadambikanda, BOMB; Goda-māni, SING

Ref. — — — — —

Habitat.—A very variable plant, some of the above synonyms corresponding to well marked varieties, which, in a work on economic products, may be treated collectively as a family plant.

flowers in April, is stemless, and has a spherical bulb often 2 feet in circumference.

Medicine.—Dymock remarks of this species: "The bulb is extremely acrid, and is used for blistering cattle, a slice being bound upon the skin. When roasted it is used as a rubefacient in rheumatism."

MEDICINE.
Bulb
2076

CROCODYLE (CROCODYLUS, Cuv.)

Crocodilus palustris, Linn.

2077

THE COMMON CROCODYLE, often vulgarly called in India, the Alligator—an American Reptile.

C. 2077

CROCUS
sativus.

The Crocodile; Saffron.

There are apparently two other species besides the above met with in India, viz., *C. porosus*, *Schneid.*, and *C. trigonops*, *Gray*. The long snouted Gavial lives on fish and turtles, and frequents the rivers of India along with the Crocodile.

Vern.—*Magr*, *kumhr*, *HIND.*; *Siran*, *SIND.*

Habitat.—Found throughout India and Ceylon, affecting rivers, lakes, marshes, and even the sea coast. It may be recognised by its shorter and broader snout than that of the Gavial, and by the first and the fourth tooth of the lower jaw fitting into the upper.

Although held sacred in many parts of India (and sometimes even tamed so far as to come for food when called, as, for example, at the Mugger Pier), the Crocodile is the terror of the rural inhabitants of India along the basins of the great rivers, not even the stakes placed around bathing places proving an effectual protection. The Crocodile often attains a great size, being from 15 to 30 feet in length, and although it is reported to eat the dead bodies thrown into the rivers, it lives mostly on live animals, but not human beings when pressed for other food.

H.

said to be eaten or

2078

2079

2080

ear to regularly extract
Watson, in his *Industrial*
this substance procured

2081

crocodile contains a larger
any fish-oil. It is pre-
pared by the Sansi tribe, in the Punjab, who eat crocodile flesh, and is
also said to be procurable in abundance at Agra (*Spons' Encyclop.*
5136).

2082

CROCUS, *Linn*; *Gen Pl.*, III., 693

This is the species of *Dioscorides*. It is not alluded to by the earlier Sanskrit writers, but Arabian authors speak of it as cultivated in the tenth century at Dairband and Isfahan, and Chinese writers state that it was introduced into their country by the Mohammedans in the Yuan dynasty (A.D. 1280).

2083

Crocus sativus, *Linn.*; *Royle*, III. *Him. Bot.*, I. 90; *IRIDEE.*

SAFFRON.

Vern.—*Jāfrān*, *BERG.*; *Kesar*, *saffran*, *HIND.*; *Safran*, *kessar*, *kecara*, *BOMB.*; *Kecara*, *MAH.*; *Keshar*, *GUZ.*; *Kunkuma*, *Admirajannid* (Ainslie), *kumtuma* (Dutt), *saurab* (Dymock), *SANS.*; *Zaafaran*, *ARAB.*, *PERS.*; *Kungumapu*, *TAM.*; *Kuntum apate*, *TEL.*; *Thanwal*, (Mr. Oliver, Forest Officer in Burma, informs the writer that this is the name for Turmeric not Saffron. The word appears in various works under Saffron and is therefore given here for the present), *BURM.*; *Kong*, *KASHMIR.*; *Kurtum*, *UNOT.*; *Zafar*, *TURK.* (according to Aitchison).

References.—*DC.*, *Orig. Cult. Pl.*, 188, *Pharm. Ind.*, 215; *Ainslie*, *Mat. Ind.*, I., 354; *O'Shaughnessy*, *Beng. Dispens.*, 531; *Blooden*, *Sheriff*, *Suppl. Pharm. Ind.*, 108; *O. C. Dutt*, *Mat. Med. Hind.*, 304; *Fluck & Hanb.*, *Pharmacop.*, 643; *Med. Mat. Pl.*, 374; *Drugs*, 42; *Surray*, 11; *135*, 1976, 121; *Baker*, *Ind. Wood*, *Bomb. Pr.*, 88; *Encyclop.*, 667; *Sim.*

Saffron; Indian Crops

CROPS.

Habitat.—The European supply of this plant comes from France, Spain, and Italy. It is cultivated in the Himalayas, and is known as *Kesar-ki-rote*.

SAFFRON.

DYE.
2084MEDICINE.
2085

(Dr Emerson) In over-doses it is generally reported to act as a narcotic poison. Ainslie gives perhaps the most complete account of the native uses of this drug, and of the opinions which prevailed among

2086

torius)

Chemistry.—§ "The colour of saffron is due to the presence of a glucoside polychroit, which is decomposed by acids, with the formation of a new colouring principle *Crocine*" (Prof Warden, Calcutta) For full particulars as to the chemistry of this drug see the *Pharmacographia*, p. 666.

CHEMISTRY.
2087

Trade in Saffron.—The imports of foreign saffron were in 1882-83, 226 cwt. valued at Rs. 4,25,124, and in 1886-87, 268 cwt. valued at Rs. 5,50,383. Of the Indian imports the bulk comes from France.

TRADE
2088

CROPS.

2089

graduation exists in which the tendency to extreme humidity or extreme aridity modifies the general character. From this point of view alone India may be said to be capable of producing the crops of the arctic, the temperate, or the tropical regions, or of the deserts and swamps of the world. But superadded to geographical peculiarities, it possesses soils

Some of the crops are said to be modified in certain provinces through the rains not occurring at the same period. Thus, in Bengal, Bombay, the greater part of the Central Provinces, and in Berar, the rains

CROPS.

Indian Crops.

occur in June, July, August, and September, being preceded by the hot season, and followed by the cold. In the Panjáb, while rain falls during those months, it is not so heavy as in December, January, and February. Rain during March in the Panjáb and North-West Provinces would be most injurious. The Panjáb, North-West Provinces, and Rajputana have two seasons of rain—July, August, and September, and again December, January, and February. In Madras, while the rainy season lasts from June to August, and August, season as in

not obtain its the commencement of the rains in Madras is the truest indication of the close of the rainy season of Northern India. Western Rajputana, a large portion of Sind, and the Southern Panjáb, have no regular rains, and are collectively often spoken of as the rainless area of India. It will thus be seen that to study the crops of India, the closest attention must be paid to this shifting of what is each year the rainy season. In the region marked crops The temperate snow during and but for the existence of a

India), the winter temperature is such that temperate annual crops may be raised. The following may be given as a brief classification of the chief crops, but fuller particulars will be found regarding each in its alphabetical place in this work.

- 2090 1st, CEREALS.—This includes Wheat, Rice, Oats, Barley, Indian-corn, Millets (various kinds), and Corn (Job's tears). (Conf. with Cereals)
- 2091 2nd, PULSES.—Such as Gram, Peas, Beans, Lentils, &c. (Conf. with Pulses)
- 2092 3rd, OTHER GRAINS.—Buckwheat, Amaranthus, Chenopodium, &c. This practically embraces all seeds which are ground into flour or eaten boiled as a staple article of diet, but which do not belong to the GRAMINEÆ (Cereals), or to the LEGUMINOSÆ (Pulses). (Conf. with Grains)
- 2093 4th, SPICES AND CONDIMENTS.—Turmeric, Ginger, Cumin, Coriander, Caraway, Pepper, Betel-leaf, Capsicum, Cardamum, &c., &c. (Conf. with Spices.)
- 2094 5th, STARCHES AND SUGAR.—Sugar-cane, Arrow-root, Sago, &c. (Conf. with Starches)
- 2095 6th, GARDEN PRODUCTS AND VEGETABLES.—Potatoes, Yams, Colocasia, Cabbage, Gourds, Melons, Cucumbers, &c., &c. (Conf. with Vegetables)
- The above might be grouped as edible products, but there are other crops some of them of even great importance, such as—
- 2096 7th, FIBRES.—Cotton, Silk, Jute, Sunn-hemp, and many others, the chief from which, after sunn-hemp, the next most important is Al (Moriada tractoria), Madder, &c.
- 2097 8th, NARCOTICS.—Opium, Ganja, Tobacco, Tea, and Coffee (Conf. with the separate accounts of each of these products and with the article Narcotics)

Crops; Sunn-Hemp.

CROTALARIA
juncea.

10th, OIL-SEEDS—Ground-nut, Rape, Mustard, Cotton-seed, Linseed, Opium-seed, Castor-oil, Gingelly or Sesame oil, &c. (Conf with Oils)

These are the principal crops of India, but the agriculturists have often other industries to occupy their attention, such as the collection of forest or jungle produce,—e.g., Lac, Cutch, Myrobalams, Wild silks, Gums

2099

CROTALARIA, Gen. Pl. I, 479.

2100

A genus of plants closely allied to the Broom, the generic name being derived from the Greek *κροτάλον* (a castanet), in allusion to the rattling noise made by the loose seeds within the inflated pods. This same idea, according to Sir Walter Elliot, is implied by the Sanskrit name *Ghanter aramu*.

Crotalaria Burhia, Hamilt.; *Fl. Br. Ind.*, II, 66; LEGUMINOSÆ.

2101

Vern.—*Sir, sissdi, meini, pola, khippi, buta, kkep, khip, khif, bhata, bā, lāthia, kharan kauriala, Pe, Ghagari, MAR, Ghugharo, GUZ., Drund, SINO*

References.—*Ind. Arch. Bot. Soc. Ind. Pl. Ind. 1881, 1882*

Rajputana Gaz., 301

Habitat.—A low under-shrub, abundant in the sandy plains of Sind, Panjāb, Rajputana, and Cambay, ascending to 4,000 feet in altitude.

Fibre.—Is said by Mr. Baden Powell to yield a good fibre for cordage, used, to some extent, in the Panjāb in place of the Sunn-hemp (*C. juncea*) of other provinces.

FIBRE.

2102

MEDICINE.

Branches.

2103

FODDER.

2104

2105

Medicine.—The branches and leaves are used as a cooling medicine.

Fodder.—The Rajputana Gazetteer states that the plant is much valued as a fodder.

C. juncea, Linn.; *Fl. Br. Ind.*, II, 79

SUNN or SUNN HEMP or INDIAN HEMP, FALSE HEMP, BROWN HEMP, DOMBAY or SALSETTE HEMP, WICKOO NAR (or TRAVANCORE FLAX), JUBBULPUR HEMP, &c., &c.

Syn.—*C. TENNIFOLIA*, Kunt

Vern.—*San, sanai, sam* (or *sun, shon*), HIND, BENG; *Amid, sulli*, ASSAM; *San, phulsan, arjha san*, N-W P.; *San tar, BOMB*; *Sini, tē, san*, SIND; *San, suna*, GUZ.; *San, ghagharn leg, MAR*; *San, tē, janab, DIS*; *Tenappa, januma, janopa* (or *shanopam*), TAM and TEL; *Janopa, pulitanyi, saltaranyi, chenam*, MAL; *Bullid, TRAVANCORE*; *Sanabu, shanabina, pundi, KAN*; *San (P), pulkhan, pait piren, BIRM*; *Hana, SING*; *San FRES*; *Sana* (*ghanteraramu*, a generic name according to Sir Walter Elliot), SANS

According to some writers the name *Amid* or *ambid* is, in Western India, given to this plant, but it seems probable that that name should be restricted to *Hibiscus cannabinus*. Indeed, it has been found difficult to arrive at any definite idea regarding the present area under sunn-hemp cultivation from the fact that the above *Hibiscus* appears to be confused with it. In Bengal, and indeed in some parts of the N-W. Provinces,

History of Suon-Hemp

CROTALARIA
juncea.

FIBRE.

to this day, although as yet it has not been reported as found anywhere between these remotely distant regions. At the same time *C. juncea* is cultivated more or less in every province of India, competing for popular favour with *Hibiscus cannabinus*, until in some parts of the Panjáb and Sind its place is taken by the wild species *Crotalaria Borhia*, which yields a fibre of such quality as to render the cultivation of *C. juncea* superfluous.

SUNN (or SAN) HEMP FIBRE.

2106

Under the heading *Cannabis sativa* the suggestion has been offered that the Greek and the Latin *cannabis* may have been derived from the

commerce. In the unmistakable references to hemp in Sanskrit, care is taken to associate with the plant qualifying and descriptive epithets that convey the idea of the well-known narcotic properties of the plant. Even the Hebrew *shesh*, generally translated flax, is suggestive of intoxication, and hence the possibility of its having been used for hemp rather than flax. DeCandolle has established very conclusively that a form of flax

the fact that the root of the word "linen" did not exist in Europe prior to the period indicated, and he adds that it does not occur in the Aryan lan-

flax. Thus even the history of flax is in some instances involved with that of hemp, such names as *shesh* implying an intoxicating power—a property of the hempen fibres possessed alone by *Cannabis sativa*. The *sana* fibres of the Sanskrit authors are *Crotalaria juncea* (*sunn* hemp), *Hibiscus cannabinus* (*sanpât*), and *Cannabis sativa* (true hemp of modern commerce). As already stated, there would seem to be every chance that the earliest writers allude under *Sana* to the fibre of *Crotalaria juncea*, but that, as the true hemp became known, care was taken by subsequent authors to dis-

name for linen, but the resemblance to the Chinese *chu-mâ* (or *schou-mâ*),

Kshauma
2107

C. 2107

CROTALARIA
juncea.

History of Sunn-Hemp

FIBRE.

the name for grass-cloth, is worth of ———. *Crotalaria juncea* for the *kshaum*, which convey ———. It was made. Thus *umf* or *atuf* made, the *patti-rastram* the *Hibiscus*-made, and *sana-rastram* in all probability the sunn-hemp-made garment. Later writers speak of *sana* garments as being used as sackcloth and worn as a mark of punishment or mortification. A prophecy in the *Vishnu Purana* speaks with scorn of the *Kahyaga* (or iron) age as one of degeneration, "when the garments of

modern historic times
remarkable that this
seeing that, as far as
sypium (cotton) is tri
(Book II., 44) we have

Sacred
Threads.
2108

of the head in three
a Vaisya of
otton for the

sana has been earned, at the present day, to the extent of violating even this injunction. *Lisboa (Bombay Useful Plants, p. 290)* states: "It appears that Manu being a Brahmin, always tried to keep this distinction, and claimed superiority for his class. But, nowadays, the sacred threads of almost all the Hindus are made of cotton."

While *Cannabis sativa* is found at the present day in what appears to be a wild state over the greater

while met with to-day almost exclusively under cultivation, would appear to be a native of India, and possibly also of Central Asia; many other species of the same genus are abundant wild plants. This fact, added to

should have lost all knowledge of the properties of a mere once in general which grows so freely, if in early times the even was as abundant as it is now. There p ever having been used in comparatively modern times as a regular textile fibre, and with the exception of the limited the natives of India do not s a source of fibre, but *san-pât* (*Hibiscus* can-agricultural purposes. me importance,—vis, t produce fibre of any

sativa.

We may conclude this brief historic review of the hemp plants by giving the opinions that prevail regarding the origin of our word "hemp."

Cultivation of Sunn-Hemp.

CROTALARIA
juncea.

FIBRE.

Royle in his *Fibrous Plants of India* traces hemp from *sana*. Speaking of *sunn*-hemp, he says: "Its name, Shanapim or Janipa on the Madras side, is not very unlike Canipa, Hampi, Hennip, and Hanf. From these we derive our own name 'Hemp'." In Mysore it is known as *sanabu* and in C.
 Vedh
 in al
 and *ganja* in Indian languages, *hanf* in German, *hemp* in English, *chanvre* in French, *linas* in Keltic and modern Breton, *cannabis* in Greek and Latin, and *kannab* in Arabic.

CULTIVATION.

CULTIVA-
TION.
2109

Sunn is grown by itself or at times is cultivated in strips or around the margins of fields. It is never cultivated as a mixed crop. Throughout India as a whole it is a *kharif* crop,—that is to say, it is sown about the commencement of the rains and cut at the end of September or beginning of October. It is thus off the ground to allow of being followed by a *rabi* crop in the same year. But in some parts of India there are two crops of *sunn* hemp. Thus in the Thana District of Bombay it is sown in November after the rice harvest, and the stalks are pulled up by the root in March. "It is also sown as a rainy-season This system has prevailed in years, for Dr. Hove, writing in thick and grew to the height I understand that it was sown grain had been gathered in," In Khandesh it is sown in June and reaped in October. In Kolaba it is sown in November, after the rice is harvested, and the stalks are uprooted in March. In Kolhapur it is sown in August and harvested in December by being cut when the plants are full grown. In Poona it is sown in July and ripens in October. In the Central Provinces and the North-West Provinces it is a *kharif* crop, being sown with the advent of the rains, but in Bengal it is sown a little earlier, namely,—from the

me astonishment at, since "it now
 " Roxburgh says it is sown in Ben-
 August,—that is to say, towards the
 Agricultural Report of Bengal it is

mean period of sowing is about the beginning of the rains (or in June), *sunn* hemp may be sown in almost any month and occupies the soil for 4½ to 5 months. This is an important feature in view of the possibility of securing a continuous supply of fresh fibre throughout the whole year. It remains to be ascertained, however, what effect this varying period of cultivation has on the quality and quantity of fibre produced. Indeed, it is probable that (as is the case with rice and other crops sown at two or more seasons each year) there may be different cultivated forms of the plant produced as the result of ancient cultivation. We are ignorant of this subject, and it seems desirable that a thorough investigation should be made. Although, as stated, everything points to *sunn* hemp being a

CROTALARIA
juncea.

Cultivation of Sunn-Hemp.

CULTIVATION
OF
FIBRE.Soil.
2110

native of India, it may be doubted if the plant has ever been found in a truly wild state. And the existence of distinct cultivated forms might not only help to confirm the opinion given of an ancient cultivation, but might also establish the superiority of certain crops over others for textile purposes. To what extent the form *C. tritallolia* is cultivated is not known, still less do we know how far it affords the superior sunn-hemp referred to by writers on this subject.

Nature of the Soil recommended for Sunn-hemp—It requires a light but not necessarily rich soil, and it cannot be grown on clay. It is therefore sown on the high sandy lands best suited for the more important crops. This is the opinion which prevails in Bengal, but Messrs. Duthie and Fuller, writing of the North-West Provinces, say: "Authorities differ as to whether a rich soil is necessarily required, and although there can be no doubt that fertility in the soil is necessary to promote great luxuriance in its vegetation, yet it cannot be contested that *sunn* will grow on poorer land than almost any other crop. One possible explanation of this may lie in the theory that plants of this order" (the per family) "can assimilate nitrogen direct from the atmosphere, and are hence less dependent on the soil for nourishment; and another explanation may be deduced from the fact that its roots penetrate deeper than those of most other crops, and can hence draw supplies from a larger body of soil." At the same time the practical experiments performed at the Saidapet farm, Madras, tend to prove that the plant would not produce so much fibre on rich as on poor soil. Speaking of these experiments Mr. Benson says: "The seed germinated well, and the plants grew with great luxuriance, but when they had reached the time for cutting, there was no fibre whatever in their stems. The soil of this plot was a sandy loam, and probably the high cultivation and watering were unfavourable to the production of fibre." A second experiment was performed, the seed being sown on "a light and very sandy loam, recently levelled." The land was manured with "12 loads or about 4 tons per acre" of horse-manure, and the results were most favourable. In the *Mysore Gazetteer* it is stated that the best soil for *sunn* is the red or black used for *ragi* cultivation. Wissot remarks that clay soils are injurious, but that on a rich soil the fibre is of a coarser quality than that grown on dry high situations. On the other hand, Roxburgh, while speaking of the cultivation in the Northern Circars, says it (this may be *C. tenuifolia*) is sown towards the end of the rains (October or November), and that a strong clayey soil suits it best.

Rotation
2111

Effects of Sunn Cultivation and the Rotation of Crops Pursued—It is all but universally believed by the Indian cultivators that *sunn*, like *gram* (see *Cleer*, C. No. 1067), improves the soil. In the *Bombay Gazetteer* (Kolhapur District, p. 172) it is stated: "As it is supposed to refresh the exhausted soil, it is considered a good *berad* or preparatory crop, and is grown as such every second or third year in some of the fields required for sugar-cane, tobacco, and other rich crops. Sometimes it is sown as a second crop and ploughed in when young as a green manure." From Poona it is reported that the leaves are considered "excellent manure." In gardens and occasionally in dry-crop lands it is grown solely for manure, the plants being ploughed into the soil when ready to flower." The Director of Agriculture in Bengal states: "It is considered by the people of the Lower Provinces to be a renovating crop, and is sometimes used as a green manure to enrich poor paddy land and land that has been infested with weeds." He adds "It comes after one of the pulses or mustard, and is followed by a pulse, sometimes by *shara* onions. When *sunn* is grown on good soil, it is sometimes followed by potatoes. It is not necessary to prepare the land well for *sunn*. Three or four

Cultivation of Sunn-Hemp.

CROTALARIA
juncea.

ploughings are sufficient." . . . "Sometimes also paddy and *sunn* seeds are sown together in the same field. When the plants have properly grown, the field is lightly ploughed and the ladder (a kind of harrow) is passed over it. The paddy plants mostly recover themselves, but the tender and juicy *sunn* is buried underground and dies. A few *sunn* plants remaining are removed at the time of weeding and buried in the soil. The roots of this green manuring does as much good to the paddy

CULTIVATION
OF
FIBRE.

insects. Linné and other say of the North American *Asclepias*. Ploughing in a green crop of hemp is known to add considerably to the fertility of the surface soil by increasing its stock of nitrogen, and it is extraordinary that this is not a general practice with native cultivators." In

TREATMENT.
2112Bombay,
Bengal.N.-W. Provin-
ces.

Madras.

pp. 238-39). Of Mysore it is stated: "It is allowed no manure; and the seed is sown broadcast on the ground, without any previous cultivation, at the season when the rains become what the natives call male,—that is to say, when they become heavy. After being sown the field is ploughed twice, once lengthwise and once across; but receives no further cultivation. At other times the *sanaba* is cultivated on rice ground in the dry season, but it must then be watered from a canal or reservoir."

Mysore.

Seed.—The amount of seed to the acre is variously stated. In the above passage from a report of experiments in Madras only 12lb to the acre were used, but in the North Western Provinces the quantity is 80lb to an acre; in the latter case the seed is sown in rows, and the plants are weeded and thinned.

SEED per
ACRE.
2113

CROTALARIA
juncea

Production and Cost of Sunn-Hemp

CULTIVATION
OF
FIBRE
Left standing
for a month
Steeped at
once

may fall on the land" It is not clear whether the crop is left on its roots,—that is to say, not reaped,—or whether it is cut and stacked on the fields—the latter more probably. The greatest difference of opinion prevails as to whether the cut crop should be dried before being steeped, or, like jute be

dry
thes

water of the tank With regard to *sunn* hemp the general rule may be almost safely laid down that in moist regions like Bengal, rapid submer

sion is preferred, and in dry regions, like Madras, stacking the crop is practised Roy

that "steeping

Bengal during

becomes weaker

hand states th

first de no be al a b f - - -

ab

co

ric

qu

ha

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

co

Fibre not
removed
from bark till
required

PRODUCE
2115

Madras districts to produce the finest *sunn* hemp

640 lbs per
acre

Bombay hemp is 150 pounds' In the Madras experiments made at the Sa dapet farm the results were for plants in flower, cut level with the ground on the 4th December, 300lb pulled up by the roots on the same day 325lb, on the 15th December, when the seed pods had partly matured, cut level with the ground 425lb, pulled up by the roots 487 5lb, and on the 24th December, when the seeds were ripe, 437 5lb The average given by Wisset is thus most likely to be a high one and the Kolhapur returns incorrect Duthie and Fuller say of the North West Provinces "The average outturn is about 8 maunds (or 640lb) of clean fibre to an acre, worth about R20"

COST
2116

COST OF CULTIVATION AND LOCAL PRICE OF FIBRE —Messrs Duthie and Fuller give the cost of cultivation in the North West Provinces, includ

fit of R4 10 In the

n acre' is given as

Royle says "The

nuch as the plant re

quires scarcely any attention and consequently little labour or expense, and it may be off the ground in time to allow ths to be prepared for any cold season crop But the expenses and the profits are as variously stated as the produce The price is also given as varying from R1 8 and R1 12 to R3 per maund" Duth

say, R2-8 a maund, but

fluctuations in late years

that in 1877 its price was

years back it stood at 20 seers

The Calcutta price is about R5 a maund

Dr Buchanan Hamilton describes two crops of *sunn* hemp as grown in his

time in Mysore Of the one he remarks the seed is sown any time after

the rains and rather thick, the quantity used being two bushels to the

Area under Sunn-Hemp.

CROTALARIA
juncea.

acre. The produce was
manufactured by the
fetched two rupees per
half. But another crop,
watered and more labour spent upon it, but the produce was more valuable. An acre, he says, required 4½ bushels of seed, and its produce was sold for about £1 2s 10½d.

AREA UNDER SUNN-HEMP—As may be inferred from what has been stated regarding the ambiguity in the Indian literature of this subject, it is next to impossible to discover the extent of *sunn*-hemp cultivation. Messrs. Duthie and Fuller, from special returns furnished for their *Field and Garden Crops*, state that in the North-West Provinces there are about 40,000 acres under the crop. But in the *Land Administration Report for 1885-86* (page 163 A) it is stated that there were 198,728 acres under "*Sanai* or *Til* (sic)" But it is further remarked that the total area under "fibres other than cotton and jute" was in that year only 123,403 acres. This last return would include hemp (proper), *sanai* and *Hibiscus cannabinus*. The Settlement Reports of Oudh show about 800 acres under *sanai*. In *Spon's Encyclopædia* it is stated that there are 50,000 acres in the Panjâb. It is not known from what source that statement was derived, but it seems highly improbable that there is more *sunn* grown in the Panjâb than in the North-Western Provinces. The returns of the Panjâb give about 40,000 acres under "hemp," but how much of that may be the true hemp plant, how much *Hibiscus cannabinus*, and what balance remains as *sunn* hemp, it is impossible to discover. Last year there were 26,614 acres of brown hemp (*Crotalaria juncea*) grown in Bombay. Full particulars regarding Madras cannot be obtained, but of the districts for which returns are available there were last year 775 acres under "*sunn*" and 83 acres under "Bombay hemp." What this Bombay hemp may be cannot be learned, but in most works on the subject Bombay hemp is a synonym for *sunn*-hemp. In 1884-85 there were 380 acres of "Bombay hemp," and in 1885-86, 330 acres, so that its cultivation would appear to be declining. Of *sunn* cultivation in Coimbatore it is reported "It can be grown anywhere and to any extent if a demand is made by agents with money in hand." In Travancore a very superior quality of fibre is produced, but it is not known to what extent the plant is cultivated. In the Central Provinces there were 24,800 acres under "False or San hemp," and in Mysore 5,076 acres. In Berar under "hemp or *Hibiscus cannabinus*," explains that there are in Berar two. The former is in all probability *Hibiscus cannabinus* and the latter *Crotalaria juncea*. In Burma and Assam there are about 500 acres, in each province, of land entered as under "fibres other than cotton and jute." No returns are available for Bengal, but from personal observation the writer would be disposed to think there must be as much in the Lower, as in the North-West Provinces.

It will thus be seen that the actual area under *sunn*-hemp cannot be
agricultural
ished But
under the

SEPARATION OF THE FIBRE.

The question as to whether the plant should or should not be dried before being placed in the retting tanks having been discussed above, there remains to be given here a brief account of the various modes of retting or of peeling the fibre and of cleaning and boiling it after it has been separated from the stems. In some localities the stems are recom-

AREA.
2117
N. W. P.
40,000 acres.

Panjâb
50,000 acres.

Bombay
26,614 acres.

Madras,
Travancore.
C. P.

Burma,
500 acres,
Bengal.

India,
150,000 acres,
SEPARATION
2118

CROTALARIA
juncea.

Methods of separating sunn-Hemp Fibre

SEPARATION
OF
FIBRE.Leaves
strippedLength of
submersionStems placed
erect in
water, then
horizontal.Deep water.
Running
water.

Damp Mud.

Cleaning of
Retted Fibre

mended to be buried in the mud at the margin of the tanks; in others, to be submerged in the water by being weighted. In others stagnant water is condemned as destroying the colour and lustre of the fibre, running streams being urged as preferable (*Gibson's account of the Bombay fibre*). But practical and comparative experiments not having been performed in the other provinces similar to those made at the beginning of the present century by Roxburgh, in Bengal a definite opinion for or against the different methods pursued cannot be offered. After removal from the ground, the stems are tied in bundles (20 to 100 in each), but the leaves are generally stripped off and left on the field.

W fall off naturally
or common practice to
plz ater for 24 hours,
so version. But the

length of time required for retting depends largely on the temperature of both the atmosphere and the water. In August and September two to three days will generally suffice. Messrs. Duthie and Fuller say of

of the loss as they are ready
a day
atts of
n, and

requires, therefore, longer exposure to retting. Then
laid down lengthways in the water and are kept submerged by being
weighted with earth. The time required for retting varies from three days

the cultivators against oversteeping the bark from the stalks easier, but
because it renders the separation of the fibre. Small pools of clear water, well exposed to the sun's
beams, seem best suited for steeping in, because heat hastens maceration,
consequently preserves the strength of the fibres, while the clean water
preserves their colour. Deep water, being cooler, requires more time for
the operation." In the same way running water, although recommended

the operation. In the same way running water, although recommended
the connecting tissues. Damp mud on
by some, is even more objectionable, as

it seems impossible to adopt this mode of retting without serious loss to
the colour of the fibre.

Having discovered that the necessity
tained, the cultivator, standing in the wa
of the stems in his hand, and threshes
gives way and the long clean fibres

According to some writers, the retted stems, after being partially washed,
are taken out of the water and placed in the sun to dry for some hours
before being beaten out in the way described. This practice, while it is
followed in some parts of the country, is condemned in others as injurious,
or at least as a useless delay. In Bengal this system is only followed
when the operator is afraid he may not be able to overtake the task of
washing before the stems would be over-retted. This partial drying of
the stems with adhering fibre would correspond to the sweating of hemp
pursued in some parts of Europe; but it seems probable that if sweating be
necessary, it could better be accomplished as a further process after the
fibre has been separated and approximately cleaned.

In Salsette Island and other parts of Bombay, little or no retting is

Cleaning Sunn-Hemp Fibre.

CROTALARIA
juncea

employed. "The plant while moist is peeled by ately dried in the open air or under cover, accor weather By peeling, the fibres are better kept arrangement, and give support and strength to each other, whereas, by the process of the Bengalese, they get so materially entangled that a great loss is always sustained If they are restored to their natural situation by the heckle, there is a loss of nearly one half of the original quantity, which renders the heckled sunn of Bengal of a high price" (Royle) The writer cannot discover any recent description of this Bombay process of separating stated, the superior quality of likely to be due to the fact that fermentation

Washing the fibre is very tedious, and a man rarely works for more than three hours at a time but is relieved by turns, he will clean 15 seers a day, which represents the fibre obtained from 5 or 6 maunds of stems Of Khandesh it is said a man earns Rs1 for cleaning 40lb of fibre

Reference has incidentally been made to the period when the crop should be cut, and before proceeding to discuss the further treatment of the fibre it may be as well to add here that the period of cutting will depend on the purpose for which the fibre is required A softer and more delicate fibre will be obtained from stems cut just as the flowers appear than if allowed to pass into the fruiting stage A few plants are always left by the cultivators to mature seed for the next year's crop, and from the stems of these they extract a strong, though coarse, fibre On the other hand, it seems to be the habit of some cultivators (the Wunjaras of Bombay) to allow the whole crop to ripen its seeds, this coarse fibre being all they desire, together with the seeds, which are valued as a food for buffaloes Old stems require a much longer period of retting

FURTHER PROCESS OF CLEANING THE FIBRE—When the fibre has been separated and thoroughly washed, it is the usual custom to hang it up over bamboos to be dried and bleached in the sun When dry it is combed if required for textile purposes or for nets and lines, but if for ordinary use—e.g., ropes and twine—it is merely separated and cleaned by the fingers while hanging over the bamboo In this primitive way the sunn hemp receives all the treatment it gets of the class known to European hemp growers as "breaking" and "scutching" European machinery for cleaning is never used It is commonly admitted that it is in cleaning the fibre that the Native generally fails most The process of washing after separation from the stems does not seem to be carefully done Royle quotes a report of a sample of sunn hemp experimented with at Hull, of which it was stated that "by using more care in the steeping and exposure, it will be fully equal to the Baltic." Such opinions are current in the reports of this fibre which appeared while the error existed of supposing it to be Indian-grown hemp or *Cannabis sativa* It is impossible to avoid the impression that sunn hemp fell into disfavour when this error was exploded An expert in 1842, for example, says: "Your hemp is very clean—a material point,—but it wants more beating and dressing, and I think the natives have not proper implements to do it with You cannot improve in your mode of packing, it is decidedly superior to the Baltic. I do not despair of seeing the produce of the Baltic supplanted by that of —" arise in the management of cut, or is too much steeped the stalk" Unfortunately such writers that the defects they complained of were due to the fact that Bombay hemp was not hemp at all, and instead of the fibre supplanting

Wages for cleaning.

Period of cutting.

Soft fibre.

Strong Coarse fibre

Seed used as buffalo food.

FURTHER
CLEANING.
2119Breaking.
Scutching

Said to be nearly as good as Baltic Hemp.

CROTALARIA
juncea.

Properties of Sunn-Hemp.

PROPERTY OF
FIBRE.
2120

£35 a ton.

EARLY
RECORDS.
2121First
Exported.

the Baltic hemp it is to-day in the same position commercially as it was a hundred years ago. While not hemp, it is a hemp substitute that deserves a better position than it has as yet obtained.

PROPERTY AND STRENGTH OF SUNN HEMP.

Unlike the golden shining jute, which occurs in long straight bundles,

of it for

Poyle states that when heckled

lying parallel to one another,

ig. Parties who have seen it

At the beginning of the pre-

voured to improve the quality

it carefully, and Royle men-

tions a sample of heckled jute sent to London by the Company that

gth of the heckled

Rheede's *Hortus*
malabaricus, v., 1A., l. 20, but in *onside in the Philosophical Transactions of London*, LXIV., page 99, also describes it. Roxburgh devoted much

the *Es*

first few years of the present, cultivated the plant. The earliest definite

mention we have of the fibre having been exported was in the year

1791-92. Although numerous favourable reports appeared shortly after

this date, the whole interest in the fibre gradually died out, and the

European methods of cleaning it met with a like fate; at the present day

the natives nowhere practise any system of growing the plant, or cleaning

the fibre that can be traced to European influence. One of the last out-

India was the issuing of

thorough enquiry into

port is the basis of all

while much money has

ing the properties of

restigations have been

a following table gives

i sunn-hemp :-

| No. | Names of the Plants. | Average weight each line broke with when dry. | Average weight each line broke with when wet. | Average weight gained by wetting the lines. |
|-----|-----------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|---------------------------------------------|
| 4 | Sunn (Crotalaria juncea) cut before the plants were in blossom, and steeped immediately | 112 | 158 | 41 |
| 5 | The same as No. 4, but dried, or rather kept some time before they were steeped | 60 | 78 | 30 |
| 6 | Sunn cut when in full blossom, and steeped immediately | 130 | 185 | 42 |
| 7 | | 100 | 166 | 66 |
| 8 | | 130 | 203 | 35 |
| 9 | | 110 | 163 | 49 |
| 10 | | 160 | 209 | 31 |

Properties of Sunn-Hemp.

CROTALARIA
juncea.

| No. | Names of the Plants. | Average weight each line broke with when dry. | Average weight each line broke with when wet. | Average weight gained by wetting the lines. |
|-----|-------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|---------------------------------------------|
| 1 | Hemp, the growth of the year 1800 from the Co's Hemp farm near Calcutta | 158 | 190 | 20 |
| 2 | Jeetee (Marsdenia tenacissima) | 248 | 343 | 38 |
| 29 | A line made of 15 threads of sail twine (<i>Calloee</i> , <i>Boehmeria nivea</i>) | 240 | 278 | 16 |

PROPERTY
OF THE
FIBRE.

From these experiments there would appear to be no room for doubt as to the superiority of the rapid steeping as compared with the drying before retting. Further, the winter crop gave the best result. Indeed,

Comparative
value.

cast by the Bo the her ast a w

East India
Company's
efforts.

pany do not appear to have taken into consideration. Their attention was first directed to the fibre in Bengal, and without ascertaining whether or not Bengal was the best field for experimental cultivation, they prosecuted the effort to improve the Bengal hemp, and failing, allowed the whole subject to drop into the oblivion from which it is only now beginning to recover; but the new trade is from Bombay, not Bengal.

Roxburgh tried the properties of sunn hemp in another way in order to ascertain the power of endurance which cords made of it had under maceration in water for a considerable period. At the same time he tested the advantages or otherwise of tanning or of tarring the fibres. The following abstract from his report may be here given—

Roxburgh's
experiments.

| NAMES OF THE PLANTS. | AVERAGE WEIGHT AT WHICH EACH SORT OF LINE BROKE | | | | | |
|--------------------------------------------|-------------------------------------------------|--------|--------|------------------------------------------|--------|--------|
| | When Fresh | | | (After 110 days' maceration) | | |
| | White | Tanned | Tarred | White | Tanned | Tarred |
| English hemp, a piece of new tiller-rope | 105 | — | — | Rotten, as was also the English log line | | |
| Hemp from the Company's farm near Calcutta | 74 | 132 | 45 | All rotten. | | |
| Sunn hemp of the Bengalese | 63 | 62 | 60 | rotten | 51 | 63 |
| Jute (<i>Burghia-fal</i>) | 63 | 62 | 61 | 45 | 42 | 60 |

CROTOLARIA
juncea.

Properties of Sunn-Hemp

PROPERTY
OF THE
FIBREDeterioration
with age.Removal of
Export Duty

According to these experiments *sunn* hemp stood the action of the maceration better than did either of the samples of true hemp. It has further been shown that a cord 8 inches in size of best Petersburg hemp broke with 14 tons, 8 cwt, 1 qr., while a similar rope of *sunn* only gave way with 15 tons, 7 cwt, 1 qr. Dr. Wight found that a rope of coir of a certain thickness broke with a weight of 224lb, of cotton with 346lb, of American aloe with 362lb, of *sunn* hemp with 407lb, of *Calatropis gigantea* with 552lb, and one of Ambári (*Hibiscus cannabinus*) with 290lb. Royle has shown the slight deterioration which *sunn* hemp undergoes in the following statement: "A rope made in 1803 broke with a weight of 6 tons, 0 cwt., 3 qrs, whereas in 1806 it gave way under a tension of 5 tons, 17 cwt, 0 qr. It is of historic interest to add in this place that the trade in *sunn*-hemp lullied until the year 1867, when the export duty was removed. From that year returns of the trade of India were regularly published, and it is noteworthy that from about the middle of the present century the bulk of the exports of raw hemp (? *sunn* hemp) went from Bombay and not from Bengal, in spite of the efforts made a few years before that date to create a Bengal trade. This would seem to point to a superiority possessed by the Bombay as compared with the Bengal *sunn* hemp. It seems probable that had this fact been realised by the East India Company, their efforts to establish an Indian hemp industry would have been more successful than was the case with their attempts in Bengal.

RECENT EX-
PERIMENTS
2122Injured by
Jute.

In a Report on the Indian Fibres by Cross, Bevan, King, and Watt, recently published by E. and F. Spon, the following passage occurs: "It is

fibre—
success—
the beginning of the century *sunn* hemp occupied a much more important

lled indigenous
ng the Colonial
to why it was
curable Mr.
hat their only
ility to procure
any other con-
the attention of
What en-
anticipated to
lay the foundation for a textile industry that may yet come to bear a

the *sunn* hemp trade of Bengal." The opinion ex-

as
ct,
al

the *sunn* hemp trade of Bengal." The opinion ex-

as
ct,
al

the *sunn* hemp trade of Bengal." The opinion ex-

as
ct,
al

the *sunn* hemp trade of Bengal." The opinion ex-

as
ct,
al

Chemical Properties of Sunn.

CROTALARIA
juncea.

actual experiment not to be the case, then there must be something in the climate or soil of Madras and of Bombay more favourable to *sunn* hemp than exists in Bengal.

CHEMICAL AND MICROSCOPIC PECULIARITIES OF SUNN.

FIBRE.

2123

lyses they show that when boiled for five minutes in a solution of caustic soda, it loses 8·3 per cent, and after an hour only 11·7 per cent. Among Indian fibres it occupies the third or fourth place in point of amount of cellulose. According to this classification, *Girardinia* or Nilgiri nettle heads the list with 89·6 per cent, then *Marsdenia* with 88·3, and after that *Crotalaria juncea* and *Sida rhombifolia* equal, each with 80·0 per cent. of cellulose. "The percentage yield of cellulose of the raw fibre is the most important criterion of its composition and value." It may be worth stating here by way of comparison that jute was found to possess 76·0 per

Percentage
of cellulose.

express an opinion opposed
would throw out the sug-
gestion that there apparently exists in some fibres a principle that may have been removed in the process of the analysis adopted by these distin-

be assigned to the famed Poya fibre of Assam, and thus in concluding these remarks a possible explanation may be sought in the mode of hydrolysis (or washing and bleaching) employed. The Poya was found to lose 62·7 per cent by being boiled in caustic soda, the residue being the cellulose upon which the low opinion of its properties is based. May it not be that under some other system of hydrolysis it would lose little or nothing, and even retain the property of great strength and durability for which it is justly esteemed by the fishermen of Assam for their lines and nets? The writer has for some time felt that one of the features of the exploration of unknown fibres should consist in the establishment, for each, of the peculiar mode of hydrolysis that injured the fibre least, and in chemical reactions that would check the natural degeneration it is liable to undergo. It seems scarcely fair to condemn or to praise a fibre according to its behaviour with one process of hydrolysis, and such a chemical result is likely to be often opposed to actual practical experience. It is satisfactory, however, to note that under a strong alkaline hydrolysis *sunn* hemp retains all its properties, and under nitration attains a great weight (150·5), being in this respect third in the list of the Indian fibres experimented with by Messrs. Cross and Bevan. A writer in *Spence's Encyclopaedia* says of *sunn* hemp: "Samples of the fibre, exposed for two hours to steam

CROTOLARIA
juncea.

Trade in Sunn-Hemp

CHEMISTRY
of the
FIBRE

at 2 atmospheres, boiled in water for 3 hours, and again steamed for 4 hours, lost only 2.93 per cent by weight, as against flax, 3.50, Manila hemp, 6.07, hemp, 6.18 to 8.44. This hydrolysis (without the aid of an alkali) so far confirms the results given above, that in point of durability under caustic alkali (processes of washing and bleaching other fibres, and deserves

MICROSCOPIC
FORM.
2124

has hitherto attained increments of the Indian fibre bundles cannot easily separated. He contains substance shows well marked adds: "Length, 3-5 mm, ends al." The writer in *Spon* not agree with the

have been plant may says 1/2 in; min, 0.157 in, mean, 0.0015 in. These measurements numbers double given by Mr King—a fact that would suggest the desirability of the maturity of seed, both by the process of drying before retting.

Re-examina-
tion desira-
ble,

TRADE IN SUNN HEMP.

Little or nothing can be learned of a definite nature regarding the extent of the trade in this fibre. It is grown in every province, and nearly universally used by the people of India, but, as already stated, definite information is not procurable owing to the confusion which exists in the use of the word "hemp" (*sunn* hemp in one case, *Hibiscus* in another, and true hemp in a third, being the fibre alluded to). For this reason, unable to discover the extent of the foreign trade in that of the exports to foreign hemp, while of

TRADE.
2125Exports
2126

discontinued the fibre according to European methods, gradually developed into a position of importance in Bombay. The exports of Indian-grown hemp* were, in 1867-68, valued at Rs. 1,04,127, but, by Act XVII of 1867, the export duty was repealed, and in the following year they were Rs. 2,91,355, and in 1869-70, Rs. 5,07,159, of the last-mentioned exports the United Kingdom worth, France Rs. 17,274, America Rs. 621, and the P and Bengal only. From these facts it will be seen that the importance of Indian hemp goes to Britain, and is more than Bengal in this trade. From 1869-70 down to 1884-85 the exports of raw hemp stood practically stationary, but in the following year

* Presumably *sunn* hemp or *sunn* hemp along with a certain amount of the fibre of *Hibiscus cannabifolius*—*sampal* or *ambadi*.

Imports and Uses of Sunn-Hemp.

CROTOLARIA
juncea.

they developed to Rs 6,88,825, and last year attained the by no means incon-

FIBRE,
TRADE IN.

factured Hempen Goods other than cordage. This continued to expand until, in 1870-71, when it was valued at Rs 1,61,433, of which Bengal had assigned to it Rs 1,53,330. The bulk of these exports went to the Straits Settlements, Ceylon, and Mauritius. From 1871-72, this trade began, however, to steadily decline, and in 1874-75 was valued at Rs 1,19,327, of which Bengal claimed Rs 1,15,875, and Bombay would appear to have taken no share. Next year these exports fell to Rs 5,299, of which

Hempen
Goods.
2127

probable that this native industry may have been ruined by the remarkable success of the Bengal jute industry. A difficulty exists in tracing

Ropes and
Cordage.
2128

the bulk of the raw fibre so reported may be the Manila hemp used up in the Indian rope factories, and of the hempen goods, canvas and other fabrics of true hemp. This trade is not extensive; last year (1886-87) only 7,641 cwt. of hemp fibre, valued at Rs 1,71,795, was imported, with, in addition, "hemp cloth and sacks to the value of Rs 43,000. Under the heading of "G. cement stores" it is possible to find an item of raw

Imports.
2129

when it was valued at Rs 90,087.

USES TO WHICH SUNN HEMP IS PUT.—The chief purpose for which

USES OF.
2131

Canvas.
2132

Sunn-Hemp-yielding Plants.

CROTALARIA
retusa.

Food and Fodder.—It has already been incidentally remarked that in some parts of India the seeds of this plant are collected and given to cattle. Roxburgh says: "This plant—and it is the only one—is also cultivated by the natives of some parts of the Northern Circars to feed their milch-cows with during the dry season. I have found that it is food."

FODDER

Seeds
2146MEDICINE
Seeds.
2147*Crotalaria laburnifolia*, Linn., *Fl. Br. Ind.*, II, 84.

2148

A shrubby plant met with in the Western Peninsula, particularly in the South Concan. Properties similar to those of the next species. It is

C. Leschenaultii, DC ; *Fl. Br. Ind.*, II, 76.

2149

An abundant plant on the Nilgiri Hills and higher portions of the Western Ghats. This is alluded to by Mr. J. H. Grant as the plant used in Satara for paper-making. It is there known as *dingoda*. Dalzell and Gibson say it is the *dingala*, and is common on the higher ghâts.

Satara
Paper.
2150*C. medicaginea*, Lank. ; *Fl. Br. Ind.*, II, 81.

2151

Vern.—*Gulabi*, Pa.

A diffuse perennial abundant in the tropical regions of India from Kashmir to Burma, ascending to 6,000 feet in altitude.

Medicine.—This plant is officinal in the Panjâb being sold in the bazârs under the name of *gulabi* (*Biden Powell, Pb. Pr.*, 343).

MEDICINE.
2152*C. prostrata*, Roxb. ; *Fl. Br. Ind.*, II, 67.

2153

A slender creeping weed, common on the drier plains of India ascending to 6,000 feet.

This is known to the Santals as *Nauha jhunka* or *Katic'jhunka*, and by them it is used medicinally in derangements of the stomach. It is known in Bengal as *Choto-jhunjhun* (small *juunjhun*, see *Voigt*, p. 207). Roxburgh says this is known in Telugu as *Seri gally-gusta*.

2154

C. retusa, Linn. ; *Fl. Br. Ind.*, II, 75.

2155

A robust under-shrub, 3-4 feet in height, with stout striated branches on sandy soils, flowering in February in the tropical regions of India from the
Also met with in China, North Aus-

FIBRE
2156

Wright states that in South India the fibre of this plant is very well sold

and property of this fibre with the true sunn-hemp. In Bengal it is

C. 2156

| The Croton | CROTON
Joufra. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| CROTON, Linn ; Gen Pl, III, 293 | 2165 |
| The generic name Κρότων (a tick) was given by Linnæus to this assemblage of plants in allusion to the shape of the seed. The chief medicinal species <i>C. Tiglium</i> , was first made known to Europe in the sixteenth century, and for some time it was in demand, but in the seventeenth century it fell | |
| Croton argyratus, Bl, Fl Br Ind, V, 383, EUPHORBACEÆ | 2166 |
| Syn — <i>C. bicolor</i> , Roxb | |
| Vern — <i>Chonoo</i> , BURM, <i>Talib dā</i> , AND | |
| References — <i>Roxb, Fl Ind, Ed C B C, 687, Gamble, Man Timb, 359, Kura, For Fl Burm, II, 372</i> | |
| Habitat — A moderate sized or small evergreen tree of Martaban, | |
| | TIMBER. |
| | 2167 |
| C. aromaticus, Linn, Fl Br Ind, V, 388 | 2168 |
| Syn — <i>C. lacciferus</i> , Linn <i>Aleurites laccifera</i> , Willd | |
| Vern — <i>Welkeppitiya</i> , SING <i>Lid punt</i> , TAM (names used in Ceylon for <i>C. aromaticus</i> , the form <i>C. laccifera</i> being <i>Keppitiya</i> in SING) | |
| References — <i>Beddome, Forester & Man, 204, Wright, Ic, t 19, 15, Lisbon U Pl Bomb, 121 Trimen, Cat Ceylon Pl, 81, Gamble, Man Timb, 358, O'Shaughnessy, Beng Disp, 553</i> | |
| Habitat — An aromatic shrub or small tree, met with in the Dekkhan from the Concan southward | |
| Medicine — Said to be used medicinally. Thwaites remarks that the lac obtained from <i>C. lacciferus</i> "is employed by the Singalese for medicinal purposes." | MEDICINE |
| | 2169 |
| | Lac |
| C. caudatus, Gussel, Fl Br Ind, V, 388 | 2170 |
| Syn — <i>C. drupaceus</i> Roxb | 2171 |
| Vern — <i>Nan bhantur</i> BENG <i>Takhabrit</i> , LETCHA, <i>Husta Uziya</i> | |
| References — <i>Roxb, Fl Ind Et C B C 658 Voigt, Hort Sub Cal, 154, Kura, For Fl Burm, II, 375 Gamble, Man Timb, 359-359 and XXX</i> | |
| Habitat. — A large straggling, more or less scandent, shrub of Bengal Assam, Burma, and South India, found chiefly on the banks of streams. Roxburgh states that it is a native in the country about Dacca, and flowers in March, the seeds ripening in September | |
| Medicine — Mr Home, Conservator of Forests, writes, the leaves are applied as a poultice to sprains. | MEDICINE. |
| Structure of the Wood — White or yellowish-white, hard, close-grained. Home says it is used for fuel | Leaves |
| | 2172 |
| | TIMBER. |
| | 2173 |
| C. Eluteria, Bennett, affords Cascarella Bark, — an imported drug. | 2174 |
| C. Joufra, Roxb, Fl Br Ind, V, 387 | 2175 |
| Vern — According to Roxburgh <i>Joufra</i> is in Syhet the name of the small tree or shrub | |

CROTON
oblongifolius

The Oblong leaved Croton

References—*K. v. l. e. f. Harm. II. 173* *Gamble's Man. Timb.* 359
Recher. T. A. Ymlr, 142, Voigt, H. v. Sib. Cal. 136

Habitat.—A small shrub very similar to *C. oblongifolius*, but with smaller more acuminate leaves, met with in the Eastern Peninsula—Sylhet, Sibsagar, Pegu, Upper Burma, &c. Flowering time March and April

MEDICINE
2176

Medicine—Like most other species the leaves, seeds, and root of this species are occasionally spoken of as used medicinally

2177

Croton lacciferus, *Thunb.*, a form reduced to *C. aromaticus*, *Thunb.*, by the *Flora of British India*.

2178

C. malabaricus, *Beddome*; *Fl. Br. Ind.*, V, 386

References—*Beddome Ic.* t. 171, & *Forester's Man.* 204; *Gamble, Man., Timb.* 359, *Lisboa, U. l. Bomb.* 121.

Habitat.—A small tree common in the western forests, ascending to 4,000 feet in altitude, Malabar, &c.

MEDICINE
2179

Medicine—Said to be used by the natives of India for medicinal purposes

2180

C. oblongifolius, *Roxb.*, *Fl. Br. Ind.*, V, 386.

Vern. — — — — — *Bara pa h* BENO (according to NEPAL, *Amrit*,
 , *SANTAL Kote*,
 , *Tel.*, *Gonsur*,
 , *Amrit*, *BURM*

References—*Roxb. Fl. Ind.*, Ed. C. B. C. 658 *Voigt Hort. Sub. Cal.*,
 , *Fl. Br. Ind.*, V, 386 *Beddome*,
Thwaites,
Ind. 201,
1867,
187,
188

in Oudh
 in Ceylon
 Calcutta,

OIL
2181
MEDICINE

Seed
2182
Fruit
2183
Root bark
2184

Root
2185

are used
 in Irvine
 Dr Dymock writes
 was drawn by the native
 one of the most valuable
 me, at the time, proved
 The Goanese and
 in chronic
 ormer disease
 application to
 est in large
 (Pharmacog)
 d for those of
 ntals use the

The Purging Croton.

CROTON
Tiglium.

the properties having been but recently understood. There is no good mention of it in the early literature of the East referred to by U. C. Dutt to justify a very ancient, and been known to the East and Western medicinal by the natives to reduce swellings. This is perhaps one of the earliest notices by European writers.

Structure of the Wood.—Whitish to yellow, close-grained, moderately hard and heavy; liable to crack in seasoning.

Domestic Uses.—The plant is frequently employed for fences.

TIMBER.
2186DOMESTIC.
2187
2188

Croton polyandrus, Roxb., see under *Bahospermum montanum*, Muell, Vol. I, B 28

Hooker, in the *Flora of British India*, V, 461, reduces this to *B. axillare*, Blume. Consult also O'Shaughnessy's *Bengal Dispens*, 555, U. C. Dutt's *Mat. Med of the Hindus*, 229, and Dymock's *Materia Medica, West Ind*, 2nd Ed, 688, the last work has appeared since the issue of the 1st volume of this publication.

C. reticulatus, Heyne; *Fl. Br. Ind*, V., 386.

2189

Syn.—*C. HYPOLEUCUS*, Dals; *C. ZEYLANICUS*, Muell. Arg.

Vern.—*Pandhari* or *pandharisala*, MAR.

References—*Dymock, Mat. Med. West Ind*, 2nd Ed, 684; *S. Arjun, Bomb Drugs*, 122; *Thwaites, En. Ceyl Pl*, 276; *Dals. and Gibs, Bomb Fl*, 231; *Lisboa, U Pl Bomb*, 121

Habitat.—A shrub with slender branches, met with in the Dekhan Peninsula from the Koncan southwards, distributed to Ceylon.

Medicine.—*Sakharam Arjun* says the bark is "used as a bitter and stomachic."

MEDICINE.
Bark.
2190
2191

C. sebiferum, Linn, and *Sapium sebiferum*, Roxb, are synonyms for *Stillingia sebifera*, the Chinese Tallow Tree. This is now cultivated to some extent in India, and, according to Roxburgh, is known in Bengal as *Momchina*.

C. Tiglium, Linn, *Fl. Br. Ind*, V, 393.

2192

THE PURGING CROTON.

Syn.—*C. PAVANA* (or *PARANA*), Hamilton

Vern.—*Same*. *Jaypal, Nepal, vialam, is given dand, datun, ARAB; Bed anyre.khatas, habbe khatdi, PERS* (according to Moodeen Sheriff.)

Ref.—*U. C. Dutt, Mat. Med. Hind*, 229; *Dymock, Mat. Med. W. Ind*, 2nd Ed, 684, *Fleming, Med Pl and Drugs*, as in

Supp. Pharm. Ind, 120, U. C. Dutt *Mat. Med. Hind*, 229; *Dymock, Mat. Med. W. Ind*, 2nd Ed, 684, *Fleming, Med Pl and Drugs*, as in

C. 2192

CROTON
Tigillum.

The Purging Croton.

At. Res., Vol. VI, 163, 174; *Flück. et Hanb. Pharmac.*, 353; *U. S. Dispens.*, 12th Ed., 67, 125; *Hent. & Trum.*, Vol. II, 212; *S. Arjun.*, *Bomb. Drugs*, 131; *Murray, Fl. and Drugs*, Sinl., 127; *Waring.*, *Harv. J. ed.*, 23; *Year book of Pharm.*, 1871, p. 24; *Irvine*, 20, 221; *K. L. Dr. Beng. Drugs*, 41; *Medical Top.*, *Arm.*, 161; *1871 Baden Powell*, *Pl. Fr.*, 72, 74, *Drury*, *U. Pl.*, 152; *Lubbock*, *U. Pl.*, *Bomb.*, 121, 215; *Hedwood*, *Bomb. Pl.*, 77; *Cole*, *Oil and Oil seeds*, 39; *Kew Off. Guide to the Mus. of Fr. Bot.*, 118; *Kew Off. Guide to Bot. Gardens and Arboretum*, 67; *Simmons*, *Trop. Agri.*, 414.

Habitat.—A small tree (15 to 20 feet high) met with under cultivation throughout the greater part of India; probably indigenous or only naturalised in Eastern Bengal and Assam and southward to Malacca, Burma, and Ceylon.

Oil.—The nuts yield an oil which is orange yellow or sherry-coloured, of the consistence of nut-oil, has a slight odour resembling that of jilap, and an acrid flavour. This is a valuable medicinal oil, which is used as a drastic purgative, especially when it is desired to act speedily and powerfully on the bowels, and when only a small volume of medicine can be administered, as in cases of obstinate constipation, in dropsy, in apoplexy, in paralysis, and in cases, when the patient cannot or will not swallow, when the oil may be dropped on the tongue. As prepared in India it is frequently so much adulterated, that it finds no sale in Europe. The nuts are exported chiefly from Bombay and Cochin (often being also Chinese re-exports), and the oil is expressed in England. Dr. Dymock informs the writer that the oil is expressed at the Government Medical Store Depot at Bombay. It costs about 12 annas a lb, whereas in 1825, the same oil was sold for about 10 shillings an ounce in England. The plant used to be grown for the purpose of its seeds at Hearn, but the supply is now imported from China via Singapore. The nuts sell for Rs 1 per maund of 4 lbs.

It is necessary to be cautious in handling the nuts or the oil, owing to their blistering the skin. The oil is frequently used for colds in the chest as an external application, causing a severe blister. It is much resorted to as a domestic cure but is not recommended by the profession.

§ "The drastic principle of the oil has not yet been isolated; it appears to exist not only in the seeds but also in the leaves and wood" (*Professor Warden, Calcutta*).

Medicine.—The SEEDS are used as a powerful drastic purgative, and the oil is regarded as a valuable medicine. In overdoses they act as an acro-narcotic poison. When externally applied the oil is a stimulant rubefacient and counter-irritant. Croton oil is said to possess powerful hydragogue cathartic properties. It is also useful in dropsy, obstinate constipation, and apoplexy. The ancient Hindu books make no mention of the oil, the nuts boiled in milk or roasted in a pellet of cow-dung, appear (as at the present day) to have been used. One seed is a sufficient dose, and, according to many writers, the skin of the seed, as also the contained cotyledons (or seed leaves), are poisonous. The boiled or torrefied albuminous substance, mashed up and deposited in the interior of a raisin, is the form in which natives generally prescribe the drug, but it is often combined with astringents, such as myrobalams, cutch, &c., these additions checking the acrimony of the nut and preventing griping. Waring says that should the administration of the nut cause griping, vomiting, or too violent purging, a good large draught of lime-juice is the best remedy, and it may safely be repeated in half an hour if the vomiting, &c., continue. Duff remarks that, according to Hindu literature, the seeds are "useful in fever, constipation, intestinal worms, enlargements of the abdominal viscera, ascites, anasarca, &c."

C. 2201

OIL
Nuts.
2193Bombay.
2194
Cochin
2195
Chinese.
2196
European
Expressed
2197

2198

MEDICINE.
Seeds.
2199
oil
2200

2201

The Purging Croton

CROTON
Tigilium.Dr. Fleming (in the *Asiatic Researches*, 1840) writes:—

"The seeds of this plant were formerly well known in Europe, under the names of *Grana Tiglia* and *Grana Moluca*. They were employed as a purgative, but on account of the violence of their operation."

MEDICINE.
Grana Tiglia.
2202

centre of it, by which precaution, it is found to act less roughly, and then rubbed with a little rice gruel, or taken in a bit of the plantain fruit."

Ainslie quotes (in the first edition of his work published in 1813) the opinions of a few Indian medical officers who re-made known the properties of the seeds of this plant, stating that they are used as a purgative."

2203

excited the most frightful hypercantharsis, although some individuals have taken it to the extent of even ten minims without any very sensible effect. He adds from his own experience, that he would be very cautious in exhibiting the oil at first in larger doses than one or two minims, to adults,

to prove a
ribbed up with
which means
Madras found

posed, by the
in cases of
dropsy, given rasped in doses of a few grains, or as much as can be held between the thumb and finger." "Rheede, who speaks of the plant under the name *caddi avandeu*, says, that the LEAVES rubbed and soaked in water also are purgative, and when dried and powdered are a good external

Root
2204Leaves
2205

Special Opinions.—"§ Drastic purgative, used in obstinate constipation and dropsy. Amounting to a few grains in Bengal. *Shib Chunder* their ment this d

2207

C. 2207

ROZOPHORA
plicata.

The Indian Turnsole.

EDICINE.
2208

Mani Dispensary, Hoshangabad, Central Provinces) "The seeds, half roasted over a lamp or candle flame, and the smoke inhaled through the nostrils, relieves a fit of asthma" (*Surgeon-Major R. Thomson, M D, C I E, Madras*) "I have found the oil diluted with 9 or 10 parts of mustard oil or olive oil to be a very useful liniment in infantile bronchitis" (*Doyal Chunder Shome*) "Have used it as a diuretic, purgative, and rubefacient" (*D Picachy, Civil Medical Officer, Purneah*). "The seed is frequently applied over the temples for headache and eye affections" (*Surgeon-Major Robb, Civil Surgeon, Ahmedabad*)

2209

Croton tinctorium, Turnsol, see Crozophora (Chrozophora) tinctoria, A Juss.

Crown Bark, see Cinchona Condamnea, Huml, RUBIACEÆ. C. 1129.

2210

CROZOPHORA, *A Juss, Gen. Pl, III., 305*

By an unfortunate oversight, the old error in the spelling of the name given to this genus was not corrected when arranging the material for the present volume, and this has had the effect of placing it in the wrong alphabetical position. Being derived from $\chi\rho\upsilon\zeta\omega$ the word should of course be Chrozophora as corrected by Necker.

2211

Crozophora (Chrozophora) plicata, A. Juss, Fl Br. Ind, V., 409; EUPHORBIAEÆ

Syn—C ROTTLEI, *A Juss*, C Plicatus, *Vahl*; C ROTTLEI, *Geissl*, C TINCORIUS, *Wall*; *Burm*, C Plicatum, *Willd* (*du Roxb, Fl Ind*)

Vern—*Shadevi, subali, sonballi, HIND, SIND and Okharada, Guz, Khudikra, BENO, Pango nara, SANTALI, Suryaparia, SANS, Pat kanda, nilkhandi, nil ak-ra, Pa, Neal boti, TANK, Gurugu chettu, linga miriyam, TFL*

References—*Roxb, Fl Ind Ed C B C, 687 Thwaites, En Ceylon Pl, 443, Dals & Gals, Bomb Fl 232 Stewart, Pb Pl 192 Elliot, Pl Andrica 66, 107, Revd A Campbell Descrip Cat Econ Prod, Chutia Nagpur, 18, Amalie Mat Ind, II, 398 Dymock Mat Med. W Ind, 2nd Ed 716 S Arjun Bomb Drugs 123, Murray Pl and Drugs Sind, 34, Drury, U Pl, 165, Lisboa, U Pl Bomb, 269; Royle, Ill Him Bot, I, 329*

Sir Walter Elliot remarks of this plant "This is the Indian Turnsol—*Royle, Ill, I, 329* Misled by the English name Wilson, Brown Piddington, and others have imagined the plant to be the sun flower, and still further to increase the confusion, they have turned the old Greek name Chrozophora tinctoria, *L* ($\chi\rho\upsilon\zeta\omega\pi\upsilon\omicron\upsilon\mu\omicron\nu\mu\iota\kappa\rho\nu$) into the modern Heliotrope, and explained the various Indian names of Croz plicata by Heliotropium (Tiardium), indicum, *Lindl, Veg King, p 281*" This mistake has been repeated by O'Shaughnessy, who says that Chrozophora tinctorium, the Turnsol (Turnsole) is the $\Pi\eta\lambda\iota\tau\rho\pi\omicron\nu\mu\iota\kappa\rho\nu$ of Dioscorides"

2212

Habitat—There are two well marked forms of this plant—(a) a small procumbent annual, found in sandy damp situations, such as on the banks of rivers and in the bottoms of dried-up tanks, (b) an erect perennial bushy form. These have apparently been reduced to one species by the *Flora of British India*. They both occur here and there throughout the warmer parts of India, from the Panjáb to Bombay, Madras, Bengal, Burma, and Ceylon. In the drier regions of Upper India the bushy condition chiefly occurs, and this is probably doubtfully distinct from Chrozophora tinctoria. The procumbent form is more abundant in Bengal,

C. 2212

The Turnsole.

CROZOPHORA
tinctoria.

Madras, and Burma, and is of no interest from an economic point of view, since the properties described below are alone applicable to the erect plant, and to *Chrozophora tinctoria*. The confusion alluded to by Sir Walter Elliot may be accounted for by the fact that the crumpled leaves of the procumbent plant are remarkably boraginaceous in their

on to
dye.

DYE.
2213

Ainslie, who saw the manuscripts of Roxburgh's *Flora Indica*, says—"It would appear that, cloth, moistened with the juice of the green capsules, becomes blue after exposure to the open air, they, no doubt, contain colouring matter, which might be turned to good account in the arts."

species

Fibre.—The Santals prepare a strong and useful rope fibre from the bark, but it is difficult to separate (Campbell).

Medicine.—The ASHES of the root are given to children in coughs

The LEAVES are used as a cathartic under the name

nikhantli, the Revd A Camp-

bell states that Carissa Carandas

for blistering Hamilton (MSS)

had brought to him in Behar, as one of those which was supposed to have virtues in leprosy affections, the dry plant is made into decoction, to which is added a little mustard" (Ainslie)

Timber.—The stems of both this and the next species are regularly collected as fuel. Dr. Stewart says of *C. tinctoria* "It is cut and carried into the city of Lahore to be used as fuel in ovens." This fact may be accepted as proving that the bush forms here alluded to are both perennial bushy plants 1-3 feet in height and not "prostrate annuals." The prostrate form would appear to be perfectly distinct, and to be most probably the *Croton plicatum* described by Roxburgh as met with in rice fields of Bengal, as distinct from the bushy perennial found in Chutia Nagpur and Upper India

FIBRE
2214
MEDICINE.
Ashes
2215
Leaves,
2216
Seeds,
2217
Root,
2218
Dry Plant,
2219
TIMBER
Fuel,
2220

Crozophora tinctoria, A. Juss., *Fl. Br. Ind.*, V, 408.

2221

TURNSOLE, Eng

Vern—*Shadeeli*, *sonballi*, *subali*, HIND & SIND, *Tappal buti*, *mlan*, *kukrona*, PB; *Kap-o-chist*, in the Hari rud Valley, Afghanistan (Aitchison)

Habitat.—Common in the Panjab, Sind, and the Deccan, distributed eastward through Afghanistan to northern Africa and the Mediterranean, cultivated in the south of France. The specimens of this plant collected in Afghanistan by Aitchison, in Quetta by Lace, and in Gilgit by Giles,

CROZOPHORA
tinctoria.

The Turnsole.

less woolly leaves than either *C. plicata* (procumbent form) or *C. tinctoria*, but is covered with a granular mealy substance

Dye—Although it seems probable that most Indian authors who allude to having observed the fruits of *Chrozophora* yielding a purplish dye, speak of the erect perennial form of *C. plicata*, still *C. tinctoria* doubtless affords the same dye in this country as it is cultivated for in France. Apparently no advantage is taken in India of the dye principle yielded by either plant, and it may therefore be of some practical utility, in any possible future efforts to establish an industry in this dye-stuff, to give here a brief abstract regarding its European uses and methods of preparation. The researches of Dr. Joly (*Ann de Chim et de Phys*, VI, 117) have shown that the dye principle occurs in all parts of the plant and not in the fruits only. It is also present during every stage of the growth of the plant and abounds in the cellular tissue occurring as coloured particles. As with indigo green so with this substance, by oxidation it becomes blue. When the fruit "is immersed in twice its bulk of water and heated to from 50° to 60°, that liquid assumes a rather deep violet blue colouration, and deposits, on being evaporated, a beautiful azure-blue resinous substance. Acids turn the colour of the aqueous solution to a yellowish red which is not rendered blue again by alkalis but becomes greenish. By this reaction, therefore, the "litmus on rags" is distinguished from the litmus of commerce. The researches of Dr. Langdale and Dr. Martius, made with the juice of the plant just described, have proved that it dyes, without the aid of mordants, a violet-red upon wool, silk, and cotton tissues, and that this colour may be rendered fast by steaming and the simultaneous action of ammonia vapours, which, however, turn the colour more blue" (*Crookes, Hand-book of Dyeing*, &c, 383). "This dye is called Turnsole, and is obtained by grinding the plants—little herbs seldom more than a foot high—to a pulp in a mill, when they yield about half their weight of a dark green coloured juice, which becomes purple by exposure to the air or under the influence of ammonia. It is chiefly exported to Holland, and is prepared for exportation by soaking coarse linen rags or sacking with it, the rags being previously washed clean. After soaking they are allowed to dry, and are exposed to the influence of ammonia by being suspended over heaps of stable manure. They are then packed in sacks and are ready for shipping to Holland" (*Treasury of Botany*). "The red colour of the outer crusts of some kinds of Dutch cheese is due to the presence of some lactic and butyric acids in that substance. No good substitute for this 'litmus on rags' for the last named purpose has as yet ever been found. A sum of £10,000 is annually paid by Dutch farmers, chiefly to the inhabitants of Grand-Callargues, for a commodity which, at first sight, no one would take to be any thing else but dirty rags, best suited for paper-making after having been

DYE
Blue.
2222

Yellow.
2223

Green,
2224
Litmus on
Rags,
2225

Powder.
2226

Sacking
Impregnated
2227

The Crustacea—Prawns, Shrimps, Crayfish, &c.

CRYPTERONIA
pubescens.

can discover no evidence of its ever having been utilised by the natives of India, but it is a remarkable coincidence that in Bengal, at least, it bears a name (*okra*) now given to several introduced American plants. Dr. Buchanan Hamilton's remarks regarding the introduction of *Bixa Orellana* having displaced an indigenous dye-yielding plant might be even viewed as having reference to *Chrosophora*. In connection with the Calcutta International Exhibition the author published, in his Catalogue

TURNSOLE-
DYE.

2229

Of Interest to
Indigo
Planters.
2230

Jatropha glandulifera or *Chrozophora tinctoria*.

CRUSTACEA.

2231

FOOD.

Crabs.

2232

Prawn.

2233

Lobsters.

2234

Cray fish.

2235

Shrimps.

2236

prawn (*chingra*) is often very plentiful in tanks, and on certain occasions may be seen to multiply in a perfectly marvellous manner—a tank sometimes suddenly appearing full of them and as suddenly empty. Although largely caught, the natives of India do not appear to fish systematically for Crustacea. Dr D MacDonald says of Bombay "The Crustacea, especially prawns, are very numerous, but mostly get caught along with real fish in the nets, and, except the crab-hook" (used at low water for catching crabs in the crevices of the rocks) "no particular gear is used in their capture. There are no lobsters, although large crayfish are commonly sold by that name in the Bombay markets, and none of the numerous crabs attain the size and quality of those of northern seas. Crab and lobster pots are unknown." Ainslie gives the following vernacular names *Ingria*, HIND, *Agri matsya*, SANS, *Eeral*, TAM, *Roicle*, TEL. He remarks that

2237

MEDICINE.
2238

animal food."

CRYPTERONIA, Bl; Gen Pl, I, 782

2239

[Man Timb, 199, LYTHRACEÆ

Crypteronia pubescens, Blume, Fl. Br. Ind, II., 574, Gamble,

2240

Vern — *Ananbo*, BURM

Habitat — A tree 20 feet — bark white — wood —

TIMBER.
2241

for fuel,

C. 2241

CROZOPHORA
tinctoria.

The Turnsole.

DYE

2222

Yellow,
2223Green,
2224Litmus on
Rags.
2225Powder,
2226Sacking
Impregnated.
2227TRADE.
2228

less weight leaves than the *C. picta* (prevalent form) or *C. tinctoria*, but is covered with a granular growth of scales.

Dye—Although it seems probable that some Indian authors who allude to having observed the fruits of *Chrozophora* yielding a purple dye, speak of the erect perennial form of *C. picta*, still *C. tinctoria* doubtless affords the same dye in this country as it is cultivated in France. Apparently no advantage is taken in India of the dye principle yielded by either plant, and it may therefore be of some practical utility, in any possible future efforts to establish an industry in the dye-stuff, to give here a brief abstract regarding its European uses and methods of preparation. The researches of Dr. Joly (*Ann. de Chim. et de Phys.*, VI., 111.) have shown that the dye principle occurs in all parts of the plant and not in the fruits only. It is also present during every stage of the growth of the plant and abounds in the cellular tissue occurring as coloured particles. As withered guaiacum so with this substance, by oxidation it becomes blue. When the fruit is immersed in twice its bulk of water and heated to from 50° to 60°, that liquid assumes a rather deep violet blue colouration, and deposits, on being evaporated, a beautiful azure-blue resinous substance. Acids turn the colour of the aqueous solution to a yellowish red which is not rendered blue again by alkalis but becomes greenish. By this reaction, therefore, the "litmus on rags" is distinguished from the litmus of commerce. The researches of Dr. Langdale and Dr. Martius, made with the juice of the plant just described, have proved that it dyes, without the aid of mordants, a violet-red upon wool, silk, and cotton tissues, and that this colour may be rendered fast by steaming and the simultaneous action of ammonia vapours, which, however, turn the colour more blue" (*Crookes, Handbook of Dyeing, &c.*, 353). "This dye is called Turnsole, and is obtained by grinding the plants—little herbs seldom more than a foot high—to a pulp in a mill, when they yield about half their weight of a dark green coloured juice, which becomes purple by exposure to the air or under the influence of ammonia. It is chiefly exported to Holland, and is prepared for exportation by soaking coarse linen rags or sacking with it, the rags being previously washed clean. After soaking they are allowed to dry, and are exposed to the influence of ammonia by being suspended over heaps of stable manure. They are then packed in sacks and are ready for shipping to Holland" (*Treasury of Botany*). "The red colour of the outer crusts of some kinds of Dutch cheese is due to the presence of some lactic and butyric acids in that substance. No good substitute for this 'litmus on rags' for the last named purpose has as yet ever been found. A sum of £10,000 is annually paid by Dutch farmers, chiefly to the inhabitants of Grand-Gallargues, for a commodity which, at first sight, no one would take to be any thing else but dirty rags, best suited for paper-making after having been bleached. A portion of the rags, after having been used to rub cheese with, are sent back, because it has been found that the old rags take up and develop the colourable matter more readily than new ones" (*Crookes*).

It would thus appear that *Chrozophora* affords a colouring principle closely allied to Orchil and Litmus, but in the method of its preparation it is closely allied also to Indigo. How far this dye is capable of meeting other markets cannot at present be foretold, but there would seem every reason to suspect that a very extensive trade might be done in it. The plant is wild everywhere on the waste lands of India, luxuriating on both dry sandy tracts and river margins; it might be grown at a small cost anywhere, and the subject thus seems well worthy of attention, as there are many purposes to which it might be put in India. The writer

The Crustacea—Prawns, Shrimps, Crayfish, &c.

CRYPTERONIA
pubescens.

can discover no evidence of its ever having been utilised by the natives of India, but it is a remarkable coincidence that in Bengal, at least, it bears a name (*okra*) now given to several introduced American plants. Dr. Buchanan Hamilton's remarks regarding the introduction of *Bixa Orellana* having displaced an indigenous dye-yielding plant might be even viewed as having reference to *Chrosophora*. In connection with the Calcutta International Exhibition the author published, in his Catalogue

TURNSOLE-
DYE.

2229

that
rs of
st be
Of Interest to
Indigo
Planters.
2230

CRUSTACEA.

2231

FOOD
Crabs.

2232

Prawn.

2233

Lobsters.

2234

Cray fish.

2235

Shrimps.

2236

Hea, only one or two are of any economic interest. The small fresh-water

especially prawns, are very numerous, but mostly get caught along with real fish in the nets, and, except the crab-hook " (used at low water for catching crabs in the crevices of the rocks) " no particular gear is used in their capture. There are no lobsters, although large cray fish are commonly sold by that name in the Bombay markets, and none of the numerous crabs

ter pots

Ingrha,

rks that

Coast

phrodis

ps with

ality of

2237

MEDICINE.
2238

animal food."

CRYPTERONIA, Bl., Gen Pl., I, 782

2239

[Man Timb, 199, LYTHRACEÆ,

Crypteronia pubescens, Blume, Fl. Br. Ind., II., 574; Gamble,

2240

Vern—Anando, BURM

TIMBER.
2241

for fuel.

C. 2241

CRYPTOMERIA
japonica.

The Cryptomeria.

CRYPTOCARYA, R. Br.; Gen. Pl., III., 150.

Several species afford valuable timber.

- 2242
- Cryptocarya amygdalina*
- , Nees; Fl. Br. Ind., V., 118; LAURINEÆ.

Vern.—*Palmaso*, NEPAL, Kalesio, LEPCHA.

Habitat.—A tree of the Garo hills eastwards to the Mowmoo range in Nepal eastwards to the ...

TIMBER.

2243

2244

- C. ferrea*
- , Bl.; Fl. Br. Ind., V., 119.

[Lisboa, U. Pl. Bomb., 113.

- 2245
- C. Wightiana*
- , Thwaites; Fl. Br. Ind., V., 120; Wight, Ic., t. 1829;

Vern.—*Golumora*, SING.

Habitat.—A tall tree, frequent in the Dekhan peninsula from Kanara southwards to Ceylon.

TIMBER.

2246

Structure of the Wood.—Strong and durable, useful for building purposes.

CRYPTOLEPIS, R. Br.; Gen. Pl., II., 740.

[Ic., t. 494; ASCLEPIADEÆ.

- 2247
- Cryptolepis Buchanani*
- , R & S, Fl. Br. Ind., IV., 5, Wight,

Syn.—*NERIUM RETICULATUM*, Roxb.Vern.—*Kavania*, HIND, *Utri dudhi*, SANTAL, *Guruga pala-tige*, *adavipala-tige*, *madana siku*, TEL (At Sinhabalam it is called *Malati* like climber, Elliot)

References.—Roxb., Fl. Ind., Ed. C.B.C., 244, Brandis, For. Fl., 330; Dals & Gids 149 Gamble, Man. Timb., 295, Kura, For. Fl. Burm., II., 109 Elliot, Fl. Andh., II., 67, 100, Campbell, Cat. Econ. Pl., Chulia Nagpur, 49, Rheede, Hort. Mal., IX., t. 11, Grah., Cat. Bomb. Pl., 113

Habitat.—A climbing plant, met with throughout India from Kashmir to Assam, Burma, Coromandel, Travancore, &c., ascending the Himalayas to 4,000 feet in altitude, distributed to Ceylon.

Fibre.—Sir Walter Elliot says the hill people of Vizianagram make cordage and a kind of cloth from the fibre derived from this plant.

Medicine.—The Rev. A. Campbell states that the Santals make a preparation from the plant which they give to children to cure them of rickets. They also combine it with *Euphorbia microphylla*, Heyne (the *dudhi phul*), in the formation of a medicine to be given to women "when the supply of milk is deficient or fails." Both the plants so used having a milky sap, it may be presumed the properties attributed to them by the Santals rest on the "Doctrine of Signatures."

CRYPTOMERIA, Don; Gen. Pl., III., 428.

2251

- Cryptomeria japonica*
- , Don; CONIFERÆ

Habitat.—A handsome tree, native of China and Japan, but largely cultivated throughout the districts of Darjeeling, Simla, and occasionally in other hill stations.

C. 2251

FIBRE.

2248

MEDICINE.

2249

Caoutchouc-producing trees.

CRYPTOSTEGIA
grandiflora.

Structure of the Wood.—White, soft, with a brown, often almost black, heart-wood; very uniform, with narrow bands of darker and firmer tissue at the edge of each annual ring.

TIMBER.
2252CRYPTOSTEGIA, *R. Br.*; *Gen. Pl.*, II., 742.

[ASCLEPIADACEÆ

Cryptostegia grandiflora, *R. Br.*; *Fl. Br. Ind.*, Vol. IV., 6;

2253

Vern.—*Vilarjuti vakundi*, MAR (according to Dr. Sakham Arjun in a letter to the author), *Palay*, MAL (according to Sir George Birdwood).

Habitat.—An extensive climber, cultivated in various parts of India; supposed to be a native of Africa or Madagascar.

Caoutchouc.—Dalzell and Gibson (*Bomb. Fl. Sp.*, 55) say "the whole plant abounds in a milky caoutchouc juice, which is like India-rubber, but hardly elastic." A considerable effort is being made to extend the cultivation of this plant both in Madras and Bombay (*See Agri-Hort. Soc. Jour., Mad., 1883-84, and Rep. Bot. Gard. Hyderabad, Sind, 1882, p. 7; also Rep. Dir. Agri. Bomb., 1883-84, p. 16*). A sample of the Sind prepared Caoutchouc, obtained from the plants grown in the Botanic Gardens, was reported on in August 1883, as follows, by Mr. T. P. Bruce Warren, Analytical Chemist to the Indian Rubber, Gutta Percha and

CAOUTCH-
OUC.
2254

the light colour of Cedar rubber. The whole had become agglomerated by the adhesiveness of the little separate masses of which the sample was composed.

"The sample was carefully torn to pieces and examined, a separate

con-
sistently

2255

washing 23 per cent

"Mixed with the suitable proportion of sulphur and heated, both portions vulcanized remarkably well. It might have been expected that the least oxidized portions would have yielded a tougher and harder product when vulcanized, as compared with the darker portions, but in this respect no difference could be perceived."

The Conservator of Forests, Northern Circle, Bombay Presidency, wrote on the 16th January 1888, that *Cryptostegia grandiflora* "is cultivated in gardens in nearly every station in India, and can be easily propagated. The cost of collecting the sap would be so great that a plantation is not

2256

CRYPTOMERIA
japonica.

The Cryptomeria.

CRYPTOCARYA, *R. Br.*; *Gen. Pl.*, III., 150.

Several species afford valuable timber.

- 2242
- Cryptocarya amygdalina*
- ,
- Nees*
- ;
- Fl. Br. Ind.*
- , V., 118; LAURINEÆ.

Vern.—*Patmaro*, NEPAL; *Kalidiso*, LEPCHA.

Habitat.—A tree with spreading branches, found from Nepal eastwards to the Khasia hills and south to the Andaman islands.

Structure of the Wood.—Strong and useful.

TIMBER.

2243

2244

- C. ferrea*
- ,
- Bl.*
- ;
- Fl. Br. Ind.*
- , V., 119.

[*Lisboa*, *V. Pl. Bomb.*, 113.

- 2245
- C. Wightiana*
- ,
- Thwaites*
- ;
- Fl. Br. Ind.*
- , V., 120;
- Wight*
- ,
- It.*
- , t. 1829;

Vern.—*Golu-mora*, SINA.

Habitat.—A tall tree, frequent in the Dekhan peninsula from Kanara southwards to Ceylon.

Structure of the Wood.—Strong and durable, useful for building purposes.

TIMBER.

2246

CRYPTOLEPIS, *R. Br.*; *Gen. Pl.*, II., 740.[*It.*, t. 494; ASCLEPIADEÆ.

- 2247
- Cryptolepis Buchananii*
- ,
- R. & S.*
- ;
- Fl. Br. Ind.*
- , IV., 5;
- Wight*
- ,

Syn.—*NERIUM RETICULATUM*, Roxb.Vern.—*Karanta*, HIND.; *Utri dudhi*, SANTAL; *Guruga-pala-tige*, *adavi-palo-tige*, *madana siku*, TEL. (At Sinhalalam it is called *Malati*-like climber; *Elliot*.)References.—*Roxb.*, *Fl. Ind.*, Ed. C B C., 244; *Brandis*, *For. Fl.*, 330; *Dals. & Gids*, 148; *Gamble*, *Man. Timb.*, 265; *Kuro*, *For. Fl. Burm.*, II., 190; *Elliot*, *Fl. Anth.*, II., 67, 109; *Campbell*, *Cat. For. Pl. Chutia Nagpur*, 49; *Rheede*, *Hort. Mal.*, IX., t. 11; *Grah*, *Cat. Bomb. Fl.*, 113.

Habitat.—A climbing plant, met with throughout India from Kashmir to Assam, Burma, Coromandel, Travancore, &c., ascending the Himá-

FIBRE.

2248

MEDICINE.

2249

2250

the Santals rest on the "Doctrine of Signatures."

CRYPTOMERIA, *Don*; *Gen. Pl.*, III., 428.

- 2251
- Cryptomeria japonica*
- ,
- Don*
- ; CONIFERÆ.

Habitat.—A handsome tree, native of China and Japan, but largely cultivated throughout the districts of Darjeeling, Simla, and occasionally in other hill stations.

C. 2251

Caoutchouc-producing trees.

CRYPTOSTEGIA
grandiflora.

Structure of the Wood.—White, soft, with a brown, often almost black, heart-wood; very uniform, with narrow bands of darker and firmer tissue at the edge of each annual ring.

TIMBER.
2252

CRYPTOSTEGIA, R. Br.; Gen. Pl., II, 742.

[ASCLEPIADACEÆ

Cryptostegia grandiflora, R.Br.; Fl. Br. Ind., Vol. IV., 6,

2253

Vern.—*Vilarjuti vakundi*, MAR (according to Dr. Sakharām Arjun in a letter to the author), *Palay*, MAL (according to Sir George Birdwood).

Habitat.—An extensive climber, cultivated in various parts of India, supposed to be a native of Africa or Madagascar.

Caoutchouc.—Dalzell and Gibson (*Bomb Fl. Sp.*, 55) say "the whole plant abounds in a milky caoutchouc juice, which is like India-rubber, but hardly elastic." A considerable effort is being made to extend the cultivation of this plant both in Madras and Bombay (*See Agri-Hort. Soc. Jour., Mad., 1883-84, and Rep. Bot. Gard. Hyderabad, Sind, 1882, p. 7; also Rep. Dir. Agri. Bomb., 1883-84, p. 16*). A sample of the Sind prepared Caoutchouc, obtained from the plants grown in the Botanic Gardens, was reported on in August 1883, as follows, by Mr. T. P. Bruce Warren, Analytical Chemist to the Indian Rubber, Gutta Percha and

CAOUTCH-
OUC
2254

the light colour of Ceara rubber. The whole had become agglomerated by the adhesiveness of the little separate masses of which the sample was composed.

"The sample was carefully torn to pieces and examined, a separate

2255

wasting 2.3 per cent

"Mixed with the suitable proportion of sulphur and heated, both portions vulcanized remarkably well. It might have been expected that the least oxidized portions would have yielded a tougher and harder product when vulcanized, as compared with the darker portions, but in this respect no difference could be perceived."

The Conservator of Forests, Northern Circle, Bombay Presidency, wrote on the 16th January 1888, that *Cryptostegia grandiflora* "is cultivated in gardens in nearly every station in India, and can be easily propagated. The cost of collecting the sap would be so great that a plantation is not

2256

CUCUMIS.

The Cucumis or Melon.

likely to be commercially successful. The plant grows wild in the Western Ghats."

Crystal Rock, see Carnellan, C. 616.

CTENOLEPIS, Host. f.; Gen. Pl., I., 832.

2257 Ctenolepis Garcini, Naud.; Fl. Br. Ind., II., 630; CUCURBITACEÆ.

Vern.—*Gudi munda*, Tel.

References.—Roch., Fl. Ind., Ed. C.R.C., 703; Dals. & Gibb, Econ. Fl., 50; Atkinson, Econ. Prod., I., p. 11.

Habitat.—An annual climber, met with in Bundelkhand and the Dekhan. Grows on rubbish heaps and hedgerows.

MEDICINE.
2258

Medicines.—Atkinson says the fruit, seeds, and roots are used in medicine.

Cubeba officinalis, Miq., see Piper Cubeba, Linn.; PIPERACEÆ.

Cubebæ, see Piper.

2259

CUCUMIS, Linn.; Gen. Pl., I., 826.

A genus of climbing herbaceous plants embracing some 26 species, of which half are natives of Africa; a few occur in the tropical regions of Asia, Australia, and America; and several are of doubtful origin though widely cultivated. Elliot says the Telugu word *Eudama* is applied generically to all species of *Cucumis*. The botanical generic name (which was the Latin specific name for the Cucumber) probably arose from *cucurus* (Latin) in allusion to the shape of the fruit.

HISTORY.
2260

History.—Much confusion still exists regarding the Indian so-called "Cucumis" or "Melon." Rumphius was the first author to distinguish the various forms. In his "Amboyna" he regards as nine species, but has since been removed to other genera, and the remaining seven reduced to three species. De Candolle, however (*Orig. Cult. Pl.*, p. 259), seems to be of opinion that they represent but two species—*C. Melo*, Linn. (embracing all the wild and cultivated Indian, African, and American forms of the Melon).

His words are:—"No Sanskrit name is known, but there is a Latin name, *Cucumis*, like the Latin *melo*." There are other vernacular names for most and cultivated; and, indeed, it

seems probable that *melo* is from the English word *melo*, pure names for the forms of those given by Wilson, Elliot.

The experiments of Naudin with the various forms of *Cucurbita* and *Cucumis* go some way towards establishing a physiological classification of these plants. He concludes that where it is possible to cross fertilize

The Sweet Melon.

CUCUMIS
Melo.

HISTORY

with the production of fertile seeds, the plants so experimented with may

2261

cases, it is evident that if nearly allied forms can be crossed and produce fertile individuals, and be considered as or contest the value of a too liberal accept

cross fertilization would maternally upset many well established species. For example, it might not be difficult to show that many of the recognised and constant forms of cotton, grown in India, are hybrids between the species *Gossypium herbaceum* and *G. barbadense*. So also it is commonly stated that a fertile mule exists between the two species of Camel—*Camelus dromedarius* and *C. bactrianus*—but the progeny is more unmanageable than the mule itself, and is accordingly very little bred (see article on Camel, C, 203). But Naudin's physiological classification

2262

of *Cucumis*, Roxburgh's species have been retained (to a large extent) as the names of forms under the species established in the *Flora of British India*

[*Mono Phanerog.*, III, 452; *CUCURBITACEÆ**Cucumis Melo*, Linn., *Fl Br Ind*, II, 620, Cogniaux, in DC.,

2263

The SWEET MELON (Stewart and also Baden Powell call this the Musk Melon, but by giving it at the same time the name *Kharbuz* they remove the suspicion of *Cucurbita moschata*. The information furnished by these authors under "*C. Melo*, *L*—musk melon" has accordingly been compiled under this species).

Vern.—*Kharbūja* or *kharbuja*, *khurbug* or *khurbusa*, HIND, *Kharmuj* BENG, *Tarbuṣ*, SANTAL, *Dungra*, C P, *Khurbusa*, KANGRA (in Sett. Rept., 25), *Kharaḥuja*, *khurbug*, *chibuda*, BOMB, *Chibunda*, MAR, *Tarbucha*, C. P. ram Arju Vellars-er Elliot), "1

seems probable that in Bombay *Tarbuja* and *kharbūja* are applied to distinct forms of the melon

References—Roxb., *Fl Ind*, Fd C B C, 701; Voigt, *Hort Sub Cal*, 58; Thwaites, *En Ceylon Pl*, 127, Dals & Gibb, *Bomb Fl*, 103, Supp., 35; Stewart, *Pb Pl*, 96, Aitchison, *Cat Pb and Sind Pl*, 63; DC., *Orig Cult Pl*, 258, Naudin, *Ann des Scien Natur*, 4th Series, Vol XI (1859), 34; Stocks, *Account of Sind*; Campbell, *Econ Prod*, Chutia Nagpur, 63; Elliot, *Flora Andhrca*, 83; Ainslie, *Mat Ind*,

The Sweet Melon.

CUCUMIS
Melo.

FOOD.

reported that occasionally manure is altogether dispensed with. The melon beds commence fruiting in April and continue yielding until they are overwhelmed by the rise of the rivers in June" (*Duthie and Fuller*). The area under melons in the North-West Provinces may be estimated at 23,000 acres annually.

In the Chandaara Settlement Report it is stated that melons are gen-

erally raised in the hot months. These

are raised in a net-work of ways. Of the plains, some are in the hands of the British, and some are in the hands of the natives. Those of the British are declared the

people fatten on them 'as horses are said to do in Bokhara.' Vigne

Report states that 300 mule-loads are annually imported thence

via the *sarda*, which, it has to degenerate out of melon in which the

is of a spherical ly sweetish and

Cultivation.—Firminger refers to two good forms of melons, one of which—the Afghan—has been alluded to above. He says "the kind which ranks as finest of all, called the *surdah*, is a native of Cabul, and has not, that I am aware, been cultivated with success in any part of India." "The seeds of this kind are at once to be distinguished from those of any other, being fully four times larger." "The next kind, second perhaps only to the *surdah*, and superior to any other with which I am acquainted, is, I believe, also from Cabul. Like the *surdah*, too, it is of the green-flesh sort. It is of a large oval form, with very smooth, pale-green exterior, traced here and there with a delicate network. This succeeded most satisfactorily at Ferozepore, and was the one which

The seeds of the melon may be known by the
by a
l, the
smaller of these melons may be grown to a size somewhat larger than a large goose's egg, with a bright yellow rind. The flavour is slightly sub-

CULTIVA-
TION
2270

2271

CUCUMIS
Melo.

Indian Forms of the Melon.

CULTIVA-
TION,

system by which the Cabul melon might be grown. It was, however, troublesome and expensive though attended with success. The chief features of this system were the selection of an open situation even by growing in gumlans on the roof of a house; the holes to be 2 feet apart; the compost with posed horse or cow manure and the remainder earth; to be sown in March, a great point being the steeping of the seeds in warm water for 24 hours; afterwards retaining them in wet ashes or a wet cloth until they sprout; as soon as sprouted to be sown about a foot apart and an inch and half deep, lastly, to be deluged with water every day from sowing until the plants are two inches above ground.

2272

Mr. Firminger comments on the watering that it should be withheld when the plants are in blossom, given freely after they set fruit, and with-

sandy soil. French writers affirm that the fruits produced nearest the root are the best, hence a system of severe pruning is recommended, each shoot from the tap root being allowed to produce only one or two fruits. The melo in the ear beetle

dust the plants with wood ashes. This must, however, be highly injurious, and since in most cases with age the plants cease to be attacked by the beetle a better course is to cover the seedling plants with a muslin frame.

The following two forms are the cucumber-like plants which, by modern European botanists, are treated as melons, and are not even allowed the position of varieties from the type.

2273

(x) *Cucumis Melo*, Linn; var. *Momordica*.

This form does not appear to be referred to in the *Flora of British India*, but it is one of the most easily recognised of the conditions of *C. Melo*. It is the *C. Melo* which by Gogniaux (in placed as a synonym also Royle, under *C. Melo*, quite smooth, not fluted spherical-ovoid) but it is frequently mottled. As Roxburgh says, the plant is more like the cucumber than the melon, except that it is less

2274

more nearly approaches the cucumber, and so is well worthy of the independent position here assigned to it.

There are several forms, but two are readily recognised—the one grown in the rains and the other in the hot season. The fruit bursts spontaneously when ripe; it is then from a foot to 2 feet long and from 3 to 6 inches in diameter, and weighs 4 to 8 lb. The seeds are smaller than

C. 2274

| Indian Forms of the Melon. | | CUCUMIS
Melo. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------|
| <p>those of the common melon. A good drawing is given of the plant by Duthie and Fuller in <i>Field and Garden Crops</i></p> | | |
| <p>Habitat.—Cultivated here and there throughout India; Roxburgh remarks that in the Carnatic it is a cold season crop. According to Duthie and Fuller there are, in the North-West Provinces, about 600 acres</p> | | |
| <p>and Europeans; when young they are a good substitute for the common cucumber, and when ripe (after bursting spontaneously) with the addition of a little sugar they are scarcely inferior to the melon, and reckoned very wholesome."</p> | | |
| <p>(2) <i>Cucumis Melo</i>, Linn.; var. <i>utilissima</i>.</p> | | <p>OIL
2275
MEDICINE
2276
FOOD.
2277</p> |
| <p>Syn.—<i>C. utilis</i>, Roxb</p> | | <p>2278</p> |
| <p>Vern.—<i>Kakri</i>, <i>kakni</i>, HIND; <i>Kakur</i>, or <i>kankur</i> (<i>Kakri</i>, according to Firminger), BENG, <i>Kukri</i>, KANGRA (in Sett Rep, 23), <i>Dosray</i>, telisri</p> | | |
| <p>Tahva, BURM</p> | | |
| <p>References—Roxb Fl Ind, Ed C B C, 701, Firminger, Man Gard in India, 128, Moodeen Sheriff, Supp Pharm Ind, 122, U. C. Dutt, Mat Med Hind, 171, S. Arjun, Bomb Drugs, 59, Baden Powell, Pb Pr, 25; Birdwood, Bomb Pr, 156</p> | | |
| <p>Description. The fruit is a small, round, greenish-white, usually changing to a bright orange colour when ripe. The seeds, like those of <i>phunt</i>, are rather smaller and more slender than true melon seeds. Firminger describes the fruit as a</p> | | <p>DESCRIPTION
2279</p> |
| <p>(Cont with a further para on cultivation)</p> | | <p>Seeds.
2280
Fruits.
2281</p> |
| <p>Habitat.—Cultivated in Bengal, the North-West Provinces, and the Panjab during the hot weather and the rains. "The fruit varies from short oval or cylindrical to elongate, and is either straight or curved like some varieties of cucumber. It varies in colour from dark green to nearly white, usually changing to a bright orange colour when ripe" (Duthie</p> | | |
| <p>C. 2281</p> | | |

CUCUMIS
sativus.

The Cucumber.

FOOD.

... her of a creamy-
... a rusty brown.
... ranges from 15
nres in Meerut to 153 in Budaun and 183 in Allahabad (*Duthie and Fuller*).

The rainy season varieties are the most common, and are universally eaten by natives of all classes as well as by Europeans. The other varieties are also used as food, being eaten raw or cooked in curry; the small hot weather kind, and those gathered in a young state, and known as gherkins, are made into pickles. It may here be remarked that the

2292

... that it may alter all
... of carefully dried specimens
by those who may have the opportunity of doing so, and Naudin's experiments in cross fertilizing the two forms of cucumber alluded to above

CULTIVA-
TION.
2293

... to by many writers, but it is scarcely necessary to repeat all their statements. The following abstract from the *Indian Forester* (written by Mr. Gollan, Superintendent, Botanic Gardens, Saharanpur) gives some particulars regarding the cultivation of hot season cucumbers or gherkins:—

"This is a variety of the common cucumber, with small egg-shaped fruit, and is also a true hot season vegetable. In order to keep up the supply until the beginning of the rains, three sowings should be made, one in the end of February, one in the middle, and one in the end of March. It will succeed fairly well in any soil, but prefers a rich one. The seeds should be laid out in drills, one foot apart. The seeds should be sown along both sides of the drill, and if the soil be dry, water should be given immediately after sowing. After germination, water every ten days, but like the *kakri* this vegetable should not be watered too often." (*Vol. IX., 162*)

Regarding the rainy season forms Mr. Gollan (*Ind. For., IX., 201*) says they have much larger fruits and are more like the English cucumber; there are two forms,—“when in a young state the colour of one is a dark green, and of the other creamy-white; when full grown, both are about a foot long, and the colour changes to a rusty brown. These two, although not equal to the commonest varieties met with in England, are not to be despised. They thrive with little care and are always sure of yielding a crop.”

2294

... forms of
... me
... ns,
... a
... ds
... he
... ch

The Cucumber.

CUCUMIS
trigonus.CULTIVA-
TION.

way it affords a very delicious dish during the rains, when so few other

down in October it may be made to yield. This is a point of some interest, since, if derived from the Indian wild stock, cultivation in Europe has completely changed the character of the plant. A writer in the *Agric-Horticultural Society's Journal* (IV, 21) says, however, that in importing seed of cucumbers, only those grown in the open air should be got; frame cucumbers are useless for India. He recommends that they

2295

appear to be ill-suited to this country."

Domestic and Sacred Uses—Atkinson remarks that "the juice is said to banish wood-lice and fish insects by strewing freshly-cut slices in their haunts." At page 371 of *Vratdaj* it is related that *Suth* told the *Kushis*, and *Shiv* told his wife *Parvatti* to worship the plant, as by doing so females do not lose their husbands, or that these survive them. The fruit is cut into thin slices and employed in the worship of snakes on *Shravan shudh 5th* (*Nagpanchmi* day). It is likewise employed in the worship of many other gods" (*Lisboa, U. Pl Bomb*, 285).

DOMESTIC,
2296

C Hardwicki, Royle, has been alluded to as most probably only the wild state of the cucumber. At the same time it bears separate vernacular names and is collected and sold for so very different purposes that it deserves an independent notice. It is known as the *air-ali* in Kumdon

2297

bably the *Kirbut* of Sind, the dried fruits of which are considered emetic, and in small doses are given to children along with honey as a useful stomachic. (Conf with account of *T. trigonus*, form *pseudo colocyntus*.)

Cucumis trigonus, Roxb, *Fl Br. Ind*, II, 619

2298

Syn—C PSEUDO-COLOCYNTHIS, Royle, C TURBINATUS, Roxb; C MADERASPATANUS, Roxb, C MELO, Linn, var AGRESTIS, Naud, C PUBESCENS, Wall C ERIOCARPUS, Boiss, BRYONIA CALLOSA, Herb Rottler

These are the synonyms given in the *Flora of British India*, but practically all the names given by the old authors for the Indian so called wild species of CUCUMIS, are now reduced to synonyms of C trigonus, Roxb. been since advanced by Gog- III, 482), where certain of the others left under C trigonus.

This may be indicated thus.—

C. Melo, Linn

2299

Var α agrestis, Naud; **SYN C MELO**, var PUBESCENS, Kunt (*Trans Asiatic Soc Beng*, 1877, part 2, p 342 Wright, I C MADERASPATANUS, Roxb Jour of Bot, 4, p 143, C non-Roxb.

Var. β culta, Kunt, **SYN C DUDAIM, Linn**, C FLEXUOSUS, Linn; IV, & A Prod, 342, C AROMATICUS, Royle, III Him Bot, pl 2, p 220.

C. 2299

CUCUMIS
trigonus.

Wild Forms of Cucumis

C. UTILISSIMUS, Roxb., *W & A, Prod.*, 342; *C. MOMORDICA*, Roxb.,
(Conf with syns given under *C. MELO* & *C. SATIVUS*)

If this view be accepted a certain amount of countenance might be inferred as given to the possibility of *C. Melo*, Linn., having been derived from some other plant than *C. trigonus*. The Indian wild plant, which perhaps most nearly approaches the melon, is that described by Roxburgh as *C. maderaspatanus*, and by Wallich as *C. pubescens*. But the subject is too complex for the writer to deal with it at present, further than to exhibit the opinions of the most recent authors. It may, however, be added that the natives of India recognise as distinct many of the plants indicated by the above botanical names or synonyms. Without attempting to dispute the conclusions arrived at by systematic botanists, it may therefore serve a practical or industrial purpose to refer to some of the old Roxburghian species and to give the various vernacular names that are in use for them in India.

properties. It may be added that the following forms may be distinguished:—*C. Melo*, and some of the the production of *C. Melo*, provided the claims of *C. maderaspatanus*, Roxb., be excluded from consideration, as the wild state of *C. Melo*, proper

2300

1 *Cucumis trigonus*, Roxb

Vern.—*Pam budinga* (Roxburgh) and *Pulcha* (Elliot), Tel.

2302

Botanic Diagnosis—This, as Roxburgh says, resembles most nearly *C. utilis*. It is never cultivated nor is it eaten. The fruit is oval smooth, distinctly three sided, with the angles round and the surface streaked, with ten light and ten deep shades of yellow.

Habit.—It is found in the Central Provinces and Central Provinces and t

OIL

2303

Oil—It is used for lamp oil, which is used for burning in lamps in some parts where the fruit abounds. It is a small plant.

2304

2 *C. turbinatus*, Roxb

Vern.—*Nulla budinga* (Roxburgh) and *nalla budama* (Elliot), Tel.

2305

Botanic Diagnosis—It is very much like *C. trigonus*, but the leaves are more deeply lobed and the segments bristle toothed. It is at the same time a smaller plant, with larger flowers and a pyriform maculated 3-cornered, smooth fruit, which is regularly eaten.

Habitat.—According to Roxburgh this is a native of the same region as *C. trigonus*, and it is probably only a form of that plant and semi-cultivated.

2306

3 *C. maderaspatanus*, Roxb

Syn.—*C. pubescens* Wall

Vern.—*Ban gumak*, *gomuk*, *Beng*, *Takmak*, *Bomb*, *Chiber*, *Sind*, *Kachri* (Stewart) *Kakri* (Baden Powell) but *Kakri* is also *C. utilis* in the Panjab. *Kodi bu-dinga* (*Kodi bu-lama*, according to Elliot, who calls it also Fowl's Cucumber) Tel., *Gong kakiri*, *Sind*; *Garakh*, *trikhamu* (Elliot), *Godumba* (Dutt) Sins

2307

Botanic Diagnosis—This is almost intermediate in type between *C. Momordica* and some of the forms of *C. sativus*. The leaves are less deeply lobed than are

C. 2307

Wild Forms of Cucumis.

CUCUMIS
trigonus.

those of *C. trigonus* or *C. turbinatus*, and in fact are almost reniform and often
hirsute with small
respects this fruit
any of the other

Bombay, and Sind
sold in the markets.
the natives and muc
plant," Atkinson states of the North-West Provinces, that "*C. pubescens*,
the *kachri* and *ban-gumak* of these provinces, occurs wild, and is occasionally culti-
vated and eaten raw or cooked. Stewart remarks of *C. pubescens* (*kachri*) that

aces, the Panjáb,
the fruits
in food by

2308

MEDICINE,
2309

C. pubescens,
commonly used as
the cucumbers
been beaten

4. *Cucumis pseudo-colocynthis*, Royle.

Syn.—*C. PUBESCENS*, Willd.; *C. ERIOCARPUS*, Boiss.; *C. CUCUTRISATUS*,
Stocks.

Vern.—*Indrayan* (= colocynth), *bislambhi* in Northern India (O'Shaugh-
nessy); *Kant*, BOMB.; *C. Hardwickii* (see ante) is known as *pahdri*-
indrayan, BUNDELKHAND; *Bislambhi* of the bazars, N. W. Provinces.
Moodeen Sheriff gives the South Indian names for what appears to be
this plant—*Hattut-tumatti*, TAN.; *Adavi-puch-cha*, TEL.

Botanic Diagnosis.—A prostrate, very scabrous plant, with gland-like hair-bearing

2310

2311

MEDICINE,
2312

bay Presidency. The fruit is of the size and shape of a small egg, and marked with
green and yellow streaks

2313

CUCURBITA
maxima.

The Pumpkin, Squash or Red Gourd.

2314

latter in a paper which Balfour says appeared in the *Agri-Horti. Soc., Proc.*

2315

CUCURBITA, Linn.; *Gen. Pl., I., 828.*

The very
with Gourds,
than has bee
forms met
most provi
are grown.

It seems likely that in
C. moschata, and C. Pepo
the most abundant. It
has been found impossible, however, to furnish a satisfactory account of
each species, and the information given below, as well as the vernacular
names, will most probably have to be materially re-arranged, in which

Benincasa cerifera (the
DeCandolle seems
y be a truly Asiatic
species and the origin of "the pumpkins cultivated by the Romans, and
in the Middle Ages" in Europe generally; but that Cucurbita Pepo is
most probably a native of America, having been the source of all the
American gourds and pumpkins that existed anterior to the discovery of
America. M. DeCandolle has not ventured to assign a habitat for
C. moschata, although he states that all writers on Asiatic and African

Its cultivation is recent in China,
species. No Sanskrit name is

either very nu
nt seems to be
pies" (p 257).

literature re-
DeCandolle's

grown, but the
while those for C. Pepo are
referring to Benincasa cerifera,
arab.

Cucurbita Citrullus, Linn.; see Citrullus vulgaris, Schrad.; Cucurbi-
[TACEE. C. 1221.

C. lagenaria, Linn.; see Lagenaria vulgaris, Linn.

2316

C. maxima, Duchesne; R. Br., II., 622.

MELON-PUMPKIN, SQUASH GOURD, RED GOURD.

The name GOURD is sometimes given to the fruit of this plant, but that is
more correctly the name of Lagenaria vulgaris.

C. 2316

The Squash Gourd.

CUCURBITA
maxima.

"... the species of CUCURBITA. He says that Bagalá does
 " — — — — — and

Botanic Diagnosis.—Leaves, 5-palmate; lobes rounded, sinus, narrow; petiole, nearly as long as the blade, not prickly; fruiting peduncle, round smooth; corolla lobes, curved outwards; calyx segments, lanceolate-linear.

2317

Habitat.—C
 of the globe.
 as the musk-m
 find either C.
 the other hand

2318

2319

regarding the species grown in them
 parts of India Atkinson, Dutt, and several other authors con-
 Jourd (*Benincasa cerifera*).

OIL.
 2320
 MEDICINE.
 2321

(Honorary Surgeon P. Kinsley, Chicacole, Ganjam). Vide "Patri-
 tioner," August 1878, Vol XXI., p. 128, quoting "Medical Examiner,"
 June 13, 1878. "The dose recommended is an ounce and a half beaten up
 with sugar. I have tried pumpkin seeds such as are sold in Calcutta as a

bably appear under *C. Pepo*—Ed.]

Food.—This plant produces the largest known cucurbitaceous fruit, in
 some cases weighing as much as 24 lb. and measuring nearly 8 feet in
 circumference. The fruit is wholesome, and when young is used as a
 vegetable. It is sweetish and yellow. When mature it will keep for
 many months if hung up in an airy place. It is largely used by natives
 of all classes in curries. When very young and tender it may be employ-
 ed as a pleasant vegetable for the European table, by being boiled, press-

FOOD.
 2322

C. 2322

CUCURBITA
moschata.

The Musk Melon

elephant to eat it the water, and several worms, with the liver, salt, and pepper" (the latter last).

Mr. Gossan says of "kadda" (pumpkin) *Cucurbita maxima* "It is there are several varieties of this species, some with small fruit as early as any season, the stable. The common one is a large globe-shaped fruit and of a brown colour. The young leaves are eaten the vegetable marrow in flavor but the fruit given fruit is also very good. The seeds should be sown from April to June. The plant requires very rich soil and the general treatment is the same as that for *Lagenaria vulgaris* (the Ashurst)." 11

2323

Firminger remarks of the "Red Gourd" or *st. furukimra*, also *Lil-luma*, "that it is a brownish-red, globular, ribbed, bluish-ribbed Gourd often more or less flattened, and by the natives is sold in the bazaar, where it is cut up and sold in various ways in my opinion the most agreeable form of any of the kind in the world. Dressed and cooked with sliced beet, as carrots are, it can easily be distinguished from them either in appearance or flavor. An annual seed sown in the rainy vegetable in use during the cold seasons; not often cultivated in gardens." It may be suspected that Firminger alludes in the above to *C. moschata* (forma *Melopepo*, R. 24) and not to *C. maxima*.

2324

The confusion between this fruit and that of the common Gourd (*Lagenaria vulgaris*) should be guarded against. Most Indian writers seem to prefer to call *C. maxima* the Gourd, and *Lagenaria vulgaris* the Bottle Gourd. In the Settlement Report, Kumbion District, "*Cucurbita maxima* (pumpkin)" is called *Guda*, Hindi. In another part of the same report and under the same scientific name occurs *Turbid*, Hindi, while "*Cucurbita Pepo* (Pumpkin)" is called *Bhujja*, Hindi.

2325

Cucurbita moschata, Duchesne; Fl. Br Ind, II, 622

THE MUSK MELOON, Eng.; POTIRON, Fr.

Syn — *C. Mrologon*, Roxb

Vern — *Sitaphal*, *saphari kumra*, *kumra*, *kadda*, *mitha kadda*, N.W. P.; *Kajj-dudhi*, Bomba

This is said to be the *Abolrade Guinea* of the Portuguese in India

2326

.. .. . the preceding but very often mar-
bles not prickly fruiting pedun-
cles of the female flower large
foliaceous

There are two primary forms—one with the fruit smooth but mottled brown and y with the fruit tor-
ulose or fluted

2327

Habitat — ia by the natives
.. .. smooth and some-
.. .. and flattened spheroidal. It
.. .. *Melopepo* of Roxburgh) is by many
Indian writers described as *C. maxima*. The long account given by
Firminger (*Van Gar for India*, 128) under the heading "*C. Melo-
pepo*, squash" has reference to imported seed of Squash, Gourd or
Vegetable-marrow, and not to the Indian cultivated fruit, *C. moschata*.
.. .. should be sown in October but in the North West
February, as the plants will not live in the
Messrs Duthie and Fuller (in *Field and*
to LX) give an account of *Cucurbita*
moschata, but do not mention any facts regarding method of cultivation,

C. 2327

The Pumpkin or Vegetable Marrow.

CUCURBITA
Pepo.

season, &c. They state that only the *Cucurbita* there figured appears to occur in the North-West Provinces. Their plates seem to represent the form Roxburgh called *C. Melopepo* and not his *C. moschata* proper, if the idea be correct that the fluted fruit is *C. Melopepo*.

OIL.
2328
FOOD.
2329

Oil—The seed yields a mild, bland, pale-coloured oil.
Food—The yellow flesh of this fruit is extensively cooked and eaten as a vegetable throughout India. There is what appears to be a form of this fruit grown in some parts of the Panjáb and North West Provinces and known as *tendus* of Bynor and *tendu* of the Duáb (*Atkinson*), *tindu* of the Panjáb. Regarding *tindu* Mr. Baden Powell says—“*tindu* (*Cucurbita tobata*?), a small round gourd when young, at which time it makes a most delicious vegetable for the table, the fruit is not bigger than a small turnip.” The writer saw in the Naga hills a form of what appeared *C. Melopepo* which would have answered to Mr. Powell's description of *tindu*.

2330

Cucurbita Pepo, DC., *Fl. Br. Ind.*, II, 622.

2331

THE PUMPKIN, VEGETABLE MARROW.

Syn—*C. Pero*, *Roxb*

Roxburgh included this plant (the pumpkin) as well as *Benincasa cerifera*, *Sonch. oleraceus*, &c. as *Cucurbita*, *Benincasa*, *Pero*, &c. Dutt, Mc

mistake

stamens—

anthers not united in *Cucurbita*, the stamens are inserted below the mouth, and the anthers are more or less united. The fruits of *Benincasa* are cylindrical, 1-1½ ft. long, without ribs, at first hairy, then

Cucurbita Pepo, *Linn*, is the *Pottu gummadi*, and *budadegummadi*, *Tel.*, and Sir W. W. Hunter that it is the *Páni kakharu* of Orissa.

It is impossible to separate the vernacular names which belong to this plant from those applied to *Benincasa cerifera* (*Conf* with that species, B 430). Moodeen Sheriff, for example, gives under “*C. Pepo*, *Roxb*,” a long list of names, most of which in all probability, refer to *Benincasa cerifera*, his Sanskrit name *Kushpandaha* or rather *Kushmanda* certainly does.

Botanic Diagnosis—Leaves 5-palmate, sinus, broad and segment pointed, petiole as long as the blade, the hairs of the lower surface

allowed to spread over the roofs of their houses

OIL
2332
MEDICINE
2333

tracts, says the leaves of this plant, as also of *C. maxima*, are used as external applications for burns

CUMINUM
Cuminum.

The Pumpkin or Vegetable Marrow.

MEDICINE.

Special Opinions.—“The fruit of the pumpkin is a similar crystalline substance” (Prof. Warden, Calcutta).

FOOD.
2334

Food.—Very little more can be learned regarding the pumpkin than has been given above. It is very much to be feared that many writers on the subject have not only confused this fruit with that of *Benincasa cerifera*, but also with *Cucurbita moschata*. An Official Note on the condition

Rolls.
2335

There are two varieties of this plant growing and used in the same way, but differing slightly, one called *bogu kumra*, and the other *ranga kumra* or *chal kumra*. It is to be feared this passage refers to either *Benincasa cerifera* or *Cucurbita moschata*. The writer does not recollect ever having

Twigs.
2336

also is the fa names “C Under the names “C *kumara*, *ladimah*, *pethi* Bijnor, Mr. Baden P interesting

Sherbet.
2337

acasa cerifera: “A and exposing it to

DOMESTIC
2338

Domestic and Sacred Uses.—The *Vrat Kaumudi* recommends the worship of this plant, considering it a goddess. “*Dharmaraj* tells *Krishna*, and *Narad* priest of the gods tells King *Chandrasen*, to observe the *Vrat* of this cucurbitaceous plant (*vide page 370 of Vratraj* in selections taken from *Padma Puran*). Its fruit is also cut with some ceremony, called *kohala muhurt*, a day or two before a marriage” (*Lisboa, U. Pl Bomb, 285*).

CUMINUM, Linn; Gen. Pl, I, 926

2339

Cuminum Cyminum, Linn; Fl. Br. Ind, II, 718; UMBELLIFERÆ.

CUMIN, Eng, the *Kūmīnorūpepor* of DIOSCORIDES, CUMINUM of HORACE and PERSIUS

Vern.—Zira, HIND, *Jiraka*, *Jiraka* or *ajaji* (Ainslie), “*Jiraka*, *Jirā*, *Jirā-utmi*, Gz., *Jire* and *Shiragam*, *Jirage*, KAN,

the vernacular names for this

Habitat.—More or less cultivated in most provinces of India, except perhaps Bengal and Assam. There seems no doubt the plant is not a native of India. Roxburgh is silent on this point, but Ainslie, who wrote

The Cumin.

CUMINUM
Cuminum.

about the same period says of the Calcutta Botanic Gardens (which were then under Dr. Roxburgh) that "the plant, however, is growing in the Botanical C

making: personal speaking the plant is a native of Egypt, but is cultivated now in India, though I am inclined to think that the greater part of the seed found in

2340

and 2nd, the quantity seems enormous. The same authority also gives 25 maunds as exported by that route. Atkinson makes no mention of in his Catalogue in February of the North-at the plant

References —Roxb., *Fl. Ind.*, Ed. C.B.C., 271; Voigt, *Hort. Sub. Cal.*,

Oil.—A medicinal oil is prepared from the seeds (=fruits).

Medicine.—As a medicine Cumin seeds are considered aromatic, carminative, and stimulant. They are also stomachic and astringent, and useful in dyspepsia and diarrhoea. The *Pharmacopœia of India* says: "The fruit, officinal in the *London Pharm.*, are met with in bazars throughout India, being much in use as a condiment. Their warm bitterish taste and aromatic odour reside in a volatile oil. Both fruit and oil possess

OIL.
2341
MEDICINE
2342

and as a seasoner for their curries. It is thought to be very cooling, and on that account forms a part of most prescriptions for gonorrhœa. It is also used as an external application to allay pain and irritation. Arabian and Persian writers describe four kinds of *Kamûn*, viz., Farsi

CUMINUM
Cuminum.

The Pumpkin or Vegetable Marrow.

MEDICINE.

Special Opinions.—{“T” round worms though uncer
B.A. M B, Monghyr). “(crystallisable variety of alb
a similar crystalline substa
Food.—Very little mor

FOOD.
2334Potted.
2335

rows of these gourds ripening along
it is eaten, cut up into small pieces and
or fried in oil. The young tops of the
tender shoots are also sometimes fried in oil or boiled in *khār* water.
There are two but differing
or *chal kumra*
cerifera or *Cu*

Twigs.
2336

also is the fact that the young twigs are eaten as a pot-herb Under the
names “C Pepo, DC, pumpkin or white Gourd—*kumra*, *kumara*,
the *lauka* and *kaddu* sased of Bijnor,
an interesting
cerifera; “A
exposing it to

Sherbet.
2337DOMESTIC
2338

shu
an
of
fro
kohala mayhāt, a day or two before a marriage” (*Lisboa, U. Pl. Bomb*,
285).

CUMINUM, Linn; Gen. Pl, I., 926

2339

Cuminum Cuminum, Linn.; Fl. Br. Ind, II., 718; UMBELLIFERE.

CUMIN, Eng, the *κόμενον* of DIOSCORIDES, CUMINUM of
HORACE and PERSIUS.

Vern.—Zira, HIND, *Jiraka*, *jiraka* or *ajāji* (Ainslie), “*Jiraka*,
jirana” (Elliot), SANS; *Jirā*, BERG; *Jira*, *jira-utmi*, Gz.; *Jire*
gire MAR, *Samun*, ARAB, *Zira*, PERS, *Zéro*, SIND; *Shiragam*,
TAM; *Jiraka* “*plakarra*” (Elliot), TEL; *Jirunge*, *jirage*, KAN,

Habitat—More or less cultivated in most provinces of India, except
perhaps Bengal and Assam There seems no doubt the plant is not a
native of India Roxburgh is silent on this point, but Ainslie, who wrote

C. 2339

CUMINUM
Cuminum.

The Cumin.

MEDICINE.

or Persian, Nabti or Nabathean, Kirmāni or black Cumin, which they say is the Basilikon of the Greeks and Shīnū or Syrian. They consider it to have the same properties as the caraway" (*Dymock*). Dutt says that the Sanskrit authors recommend "a poultice made of cumin seeds with the addition of honey, salt, and clarified butter" to be applied externally for scorpion bites.

Special Opinions.—§ "Used as carminative and stomachic, half drachm

Saha-
reg-
"Sa-
ecre-

... *Gün*, Lahore). "A quantity of the seeds
... pipe and smoked relieves hiccup"
... *D, C I E, Madras*). "A reputed
... *ov* 1881, Vol XXVII, p 385, and
denies this action" (*G B*)

amin has been dealt with fully by

CHEMISTRY.

2343

Flückiger and Hanbury (*Pharmacog*, 332), and their account reproduced in *Dymock's Materia Medica* (2nd Ed., 369). It is not necessary therefore to repeat the information there given, since either of the works referred to is likely to be in the hands of the student of Indian *Materia Medica*. Professor Warden has, however, contributed the following brief note for the present publication:—

"The fruit contains an essential oil, which is a mixture of Cymol and Cuminol, and other hydrocarbons. Cymol is also a product of the dry distillation of coal tar."

FOOD.

2344

the natives

TRADE.

2345

Trade.—Cumin (or Cummin) would appear to have been known to the ancients; at least there are names for it in most of the classical languages. During the middle ages it was one of the most favoured of spices. In one instance it is recorded that during 716 A.D. an annual provision was made for 150lb of Cumin for the monastery of Corbie in Normandy. Similar records might be quoted from the literature of most European countries down to comparatively modern times. It was in frequent use, for example, in England in the 13th century, and in 1453 was one of the articles of which the Grocers' Company of London had the weighing and oversight.

Foreign

Trade.

2346

At the present day the European demand has greatly declined, the place of Cumin having been taken by Caraway. England receives her supplies mainly from Malta, Sicily, and Morocco, only a small amount being obtained from India. According to the returns of Sea-borne Trade issued separately

2347

was re-
Sea-borne Trade as issued by the Local Governments, State ...
export of Cumin from Bombay in the year 1872-73 was 6,766 cwt., and 20,040 cwt. from Calcutta in the year 1870-71." These are misleading quotations, since only about one-fourth of those amounts left India, the remainder represented the coasting traffic, and hence a further error, since some of the coasting imports into each of the ports named would have

The Weeping Cypress.

CUPRESSUS
funnebris

therefrom Thus of the exports
 per Indian ports, nearly 2,000 cwt
 must have greatly influenced the
 Bombay exports of the year. These remarks have been considered
 necessary owing to its being customary to find India assigned a far
 larger share in the world's trade in Cumin than is justified by the
 official returns. An analysis of the figures for the year 1875-76, com-
 pared with those for 1886-87, will remove this misconception. Last year
 the total exports were — Indian grown Cumin 9051 cwt + foreign
 imports re-exported 1,260 cwt, or a total of 10,311 cwt. This amount
 was valued at Rs. 1,41,486. In 1875-76 the total exports were 8,120 cwt,
 valued at Rs. 94,919. The foreign trade in Cumin has thus slightly
 improved, but it falls far short of what most readers would infer from
 the amounts quoted above as exported from two of the Indian ports.
 Of the foreign imports, India received in 1875-76 only 538 cwt, and last
 year 2,020 cwt, so that deducting the re-exports, 760 cwt was thus
 added to the amount locally produced in 1886-87. But of the foreign
 imports 1,994 cwt came from Persia and the remainder from Turkey in
 Asia
 to Sin going
 Bomb untries
 cwt. as 250
 Arabia
 and East coast Africa each received a little over 1,000 cwt; France 430
 cwt, and the United Kingdom only 95 cwt.

TRADE.
Foreign
Trade

2348

The Indian internal trade in Cumin must be at least four times as ex-
 tensive as the foreign, but the ramifications of road, rail, river, and coast-
 wise-borne traffic are attempt to adjust the
 an idea of the actual
 ever, be stated that, to
 to consume more than

Internal
Trade.
2349

than can possibly be produced in the Lower Provinces. These two facts
 would seem to point to the North-West Provinces and the Panjáb as the
 chief seats of Indian production, the railways carrying to Calcutta a large
 quantity, a portion of which is shipped to Madras to meet the South
 Indian market.

Dr Dymock says of the Bombay traffic in Cumin that it "comes
 from Jubbulpore, Guzerat, Rutlam, and Muscat. Value, Rutlam, Rs. 8 to
 Rs. 9 per Surat maund of 37½ lb., Muscat Rs. 6 to Rs. 6½, Guzerat, Rs. 3 to Rs. 7½,
 Jubbulpore, Rs. 3 to Rs. 6."

2350

Domestic and other Uses — By the ancients smoking Cumin seeds was
 considered to produce pallor of the countenance.

DOMESTIC.
2351

Cuprea Bark, the bark of *Ramya purdicana* or *R. pedunculata*, see Cin-
 chona, C. 1152

CUPRESSUS, Linn; Gen. Pl., III., 427.

[Timb., 410. CONIFERÆ
 Cupressus funnebris, Endl., Brandis, For. Fl., 534. Gamble, Man.
 THE WEEPING CYPRESS

2352

Veru.—Chandang, Ichenden, BRUTIA

Habitat.—A handsome tree with pendulous branches, and a fibrous
 brown bark, often planted in Nepal, Sikkim, and Bhutan, near temples
 and monasteries, and in China (Gamble).

C. 2352

CUPRESSUS
torulosa.

The Cypress.

2353

Cupressus glauca, Lam

Habitat—Very generally cultivated in Western India above the Ghats (Dalt & Gibs, Bomb Fl Supp, 83)

2354

C. sempervirens, Linn.

THE CYPRESS

Vern—Sara, saras, N W INDIA, Farash, SIND, Saráboké, MAR

References—Roxb Fl Ind Ed CRC 6-8 V 1, H & C 1,

558, Brandis,

Pl, 222, Brown

S Arjun, Bom

Powell, Pb Pr

857, Kew Off (

Gardens and Arboretum, 131

Habitat—A

West India, som

in height Aitch

tree near the shrine at Shálizán.

Medicine.—WOOD and FRUIT are regarded as astringent and anthelmintic

Structure of the wood is hard.

Very fra

It is

prized

for trunks and boxes, the contents of which are proof against most insects (Brandis)

2358

C. torulosa, Don

HIMALAYAN CYPRESS

Vern—Dev-dar, RAVI, Deodar, KULU, BHAJI, Gulla, gulrai, kallain, HIMLA; Leauri, JAUNSAIR, Raisalla, sarai, KUMAON, Sarru, sarah vyu, TIBET

References.—Vogt, Hort Sub Cal, 538, Brandis, For Fl, 533; Gamble, Man Timb, 410, Dalt & Gibs, Bomb Fl, 83, Stewart, Pb Fl, 222, Indian Forester, IX (1883), p 59, X (1884), p 2, XI (1885), p 5; Baden Powell, Pb Pr, 576, Lisboa, U Pl Bo b, 133, Balfour, Cyclop, 857, Kew Off Guide to Bot Gardens and Arboretum, 146.

Habitat—A large tree growing on the outer ranges of North-West Himalaya, from Chambr to Nepal, scattered or in numerous isolated localities of greater or less extent, chiefly on limestone, between 5500

RESIN

2359

TIMBER

2360

very fragrant, moderately hard. Has been much used at Naini Tal for building, and is sometimes used for beams on the Ravi and Sutlej. In Kulu it is made into images, and is used for the poles which carry the sacred ark. It is often burnt as incense in temples. The Indian Forester (Vol X, 63) gives the following analysis of the ash:—

| | |
|----------------------------------------|-------|
| Soluble potassium and sodium compounds | 0.004 |
| Phosphates of iron, calcium, &c | 0.037 |
| Calcium carbonate | 0.043 |
| Magnesium carbonate | 0.008 |
| Silica with sand and other impurities | 0.006 |

TOTAL . . . 0.099

C. 2360

Copper.

CUPRUM.

CUPRUM or COPPER.

Cuprum; *Man. Geol. Ind., III., 239, IV., 4.*

2361

COPPER; MINERAL DE CUIVRE, *Fr.*; KUPFERERZ, KUPFER
BLENDE, *Germ.*; MINERALE DI RAME, *Ital.*Vern.—*Tambah, tãnbã, tãmd, HIND., DEC.; Tama, BENG.; Tãmsra, SANS.;*
Trambã, GUZ.; Tãmbra, KAN. & MAR.; Nohas, ARAB.; Mss, PERS.;
Shenbã (sembã), TAN.; Rãgi, tãmrãm, shenbã, MAL., TEL.; Kaiye-
ni, BURM.; "Zangs, BHOTE; Mss, TURKI; The Sulphate Nila-tũsya,
*PB.; Nila-thokar, BHOTE; Dina-sarang, TURKI (Dr. Aitchison.)"*References.—*Pharm. Ind., 378, 393-395; Ainslie, Mat. Ind., 504-508,**Ure, Dic. Indus, Arts and Manu.,**Madras, 27, 45; Bomb. Gaz., V., 123;**Brass and Copperware, Punjab, by D.*Consult also the numerous publications referred to by Ball (*Man. Geo.*
Ind., III., 611).

DISTRIBUTION OF COPPER ORES IN INDIA.—The following brief note has been furnished for the present publication by H. B. Medlicott, Esq., F.R.S.:—"The most widely-extended copper deposits at present known to exist in Peninsular India are in the district of Singbhũm and the State of Dhalbhũm, to work which, Companies have several times been started and given up again. At Baraganda, in the Hazãribagh district, there are copper ores and traces of old workings; and a Company has recently been started to work these ores. In Rajputana, copper ores are found in several of the independent States, and in the British district of Ajmir mining has been practised on a large scale, but is now almost extinct. In Afghan various
Province
cessfull
would

DISTRIBUTION.
2362

was opened some years ago
copper ores which occur are
known to exist and to have
tracts of the Madras Presi-

dency."

For detailed information regarding the Indian mines and sources of copper ore the reader is referred to Ball's account in the *Manual of the Geology of India (Part III., pp. 239 to 280)*. With a work already in the hands of the public which disposes so fully of the subject it would be superfluous to give here what at most could be but an abstract of

2363

number of people. With the appliances presently used by the native miner the access of water has always proved fatal to extended operations. Euro-

C. 2363

CUPRUM

Copper.

DISTRIBUTION.

pean companies have several times been started but soon dissolved, and it would appear that the hope of Indian copper mining lies in the improvement of native means and appliances. *Ball's list*: "The copper ores of Peninsular India occur both in the older crystalline or metamorphic rocks and also in several of the groups of transition rocks, as, for example, in the Cuddipah, Bijwar, and Arsal groups. In extra peninsular India they are found for the most part in highly metamorphosed rocks, the precise age relations of which to those of the peninsula are not in all cases clearly made out as yet.

2364

"The ore of most common occurrence is the copper or pyrites, but towards the outcrop it is commonly altered into carbonates or oxides. The associated minerals are in general identical with those which are found under similar circumstances all the world over. Recent analyses by Mr. Mallet have tended to clear up much of the uncertainty which attached to two minerals which were found in Indian copper mines, and were supposed, by those who first examined and described them, to be worthy of specific distinction; these were called respectively Mysoria and Sycoporite. As a rule, to which there are probably not very many exceptions, the copper ores of India do not occur in true lodes, but are either sparsely disseminated or are locally concentrated in more or less extensive bunches and nests in the rocks which enclose them; occasionally cracks and fissures traversing these rocks have by infiltration become filled with ore which thus resembles true lodes. In not a few cases it is believed that the ores exist only as the merest traces. ... At the present day, the extraction and smelting of copper ores are only carried on in the most petty manner. In the majority of cases the miners are unable to cope with the water which floods their mines, and, in spite of the fact that their earnings are small, the copper which they turn out cannot be sold at a price which would enable it to compete at the regular markets on equal terms with metal imported into India." Mr. Mallet writes: "Perhaps the most remarkable specimens of native copper hitherto found in India were those obtained in Kashmir, from the lower part of the Zaskar river, where it flows through tertiary rocks. In 1878, several water-worn masses of pure metal, reaching up to 22 lb in weight, were discovered in the bed of the stream, and were subsequently, when in the possession of the Governor of Ladakh, seen by Mr. R. Lydekker. There is a specimen in the Geological Museum (weighing about 21 oz) cut from a lump of some 20 lb. Although nearly all solid copper, it includes a little cuprite, especially on the sides of one or two cavities; 120 grains of the metal was tested for silver and found to contain a minute trace only. The source whence the nuggets came has not been traced; but recollecting how frequently native copper is connected with trappean rocks, as in the well-known Lake Superior mines, the conjecture may, perhaps, be hazarded that the vicinity of the trappan intrusions which occur between the tertiary and the carboniferous strata of the Markha valley, is one of the most likely localities for the copper to have been washed from."

FOREIGN
TRADE
2365

FOREIGN TRADE IN COPPER—The imports in 1886-87 of copper ore, old copper, unwrought and wrought copper, amounted to 615,049 cwt., valued at R1,99,40,085. For the past 20 or 30 years the imports of copper have steadily increased with the increased agricultural prosperity of the people, but within that period they have borne a marked relation to the fluctuations of agriculture. In the year 1885-86, the imports amounted to 652,973 cwt., valued at R2,09,38,405, and in 1882-83, they were 450,098, valued at R1,93,83,758. Mr. O'Connor, in his *Review of the Sea-borne Trade of India for 1884-85*, says: "The price of copper has for some time been constantly declining in England. In January

Copper Sulphate.

CUPRI Sulphas.

FOREIGN
TRADE.

for a ton, in January 1894, at £57-5s. of this year it had further fallen to £45-0s. much lower, falling below £45-0s. than it has ever been, being more than 12 per cent. below the lowest price ever known, and authorities state 30 per cent. below what the trade had previously considered a safe and moderate price. This decline is due to a greatly increased production in the United States, and it would seem to those who are in a position to estimate the conditions of future production there and elsewhere that prices must continue permanently on a low level. In Calcutta, Australian copper was quoted at Rs 12-12 in January 1892, and it has fallen persistently since to Rs 4-10 in January 1895. Over 50 per cent. of this trade is every year the ship India with Australia are becoming more intimate.

2366

Cupri Sulphas.

2367

COPPER SULPHATE OR BLUE STONE.

Vern.—Nila-thaiha, nilā tūā, nilā-tūiā, हिन्द; Mōr-tūtā or mōr-tūtā, DEC; Mōr-tūtā, GUZ; Tūtā, tūtā, BENG; Tūtā-thanjānām, tūtā, SANS; Mōr-tūtā, tūtā, turku, tūtā-turichī, TAM; Mōr-tūtā, TEL; Mōr-tūtā, turishā, MAL; Mōr-tūtā, KAN; Zājul akhār, sāj akhār, qāqānd, ARAB; Zāk sās, PERS; I almanikām, SING; Douthā, BERN; Tūi, MALAY

References.—I harm Ind., 378; Moonen Sheriff's Suppl. to Pharm Ind., 123; U. C. Dutt, Mat Med Hind., 46; Waring & Bosser Med., 4.

Medicine.—U. C. Dutt says: "Sulphate of Copper has been known in India from a very remote period. It is prepared by roasting copper pyrites, dissolving the roasted mass in water, and evaporating the solution to obtain crystals of the sulphate. It was known as a salt of copper, for the *Blid-vaprakṣa* says it contains some copper and therefore possesses the properties of that metal. It is emetic, caustic, and useful in eye."

MEDICINE,
SALT,
2368

It is purified for internal use, by being exposed to heat in a crucible. It is then soaked for three days in whey and dried. Sulphate of copper thus prepared is said not to produce vomiting when taken internally. Dose, one to two grains. The *Pharmacopœia of India* says: "Hindū practitioners place much reliance on some of their rudely prepared salts of copper, which, for the most part, are of acid juice on

2369

The sulphate of copper, if of quality, may be further purified, it required, by dissolving in water, filtering and evaporating to crystallization."

2370

According to European Medical practice pure sulphate of copper is tonic, astringent, emetic; in large doses, an irritant poison. Locally applied in substance to a denuded or granulating surface, mildly caustic, styptic, and in solution stimulant. The article so used is imported from Europe. It is largely used in chronic dysentery, diarrhoea, epilepsy, chorea, and hysteria. Locally, it is applied in solution in gonorrhoea, leucorrhoea, purulent ophthalmia, weak ulcers, superficial hæmorrhage,

2371

2372

C. 2372

Siyah Musli.

CURCULIGO
orchioides.MEDICINE.
Black root.

2376

White root.

2377

Substitutes.

2378

white Asparagus adscendens A
 roots of Bombax malabaricum con.,
 these the black and white forms are obtained from one and the same

sometimes sold by the native druggists of Calcutta under the name of
 These articles have, however, separate names and are not

C. ensiformis is the same musli. It further states that much of the white
 root sold in the Bombay Presidency is Aneilema scapiflorum, Wight
 (Conf. A. 1122). Dr. Dutt says of C. orchioides: "The tuberous roots of
 this plant are considered
 debility, and impotence."

of this plant is considered

the taste, and is supposed to possess virtues nearly similar to the last-men-
 tioned article. It is prescribed in electuary, in the quantity of a tea-
 spoonful twice daily; it is also considered as possessing tonic qualities,
 and sometimes given with milk and sugar, in doses of two drachms in
 the twenty-four hours, in cases requiring such medicines." Dr. Dymock

diarrhoea, colic, and

ic, tonic, and aphro-

and bitters." Native

are collected should

and freed from rootlets,

cut in slices by a wooden knife and dried in the shade. Dose 180 grains

2379

TRADE.
2380

Special Opinions.—§ "The tuber is regarded as a cooling medicine,
 is useful in the phosphatic diathesis, and in scleroderma. It is said to
 possess powerful aphrodisiac properties. It is largely used in medicines
 by native practitioners" (Surgeon Major F. M. Houston, Durbar Physi-
 cian, Travancore, and Civil Apothecary John Games, Medical Store-keeper,
 Travancore).

C. 2380

CURCUMA
angustifolia.

Wild Arrowroot.

Solar heat to
be avoided.Use of Caustic
Soda.Cochin.
2392
Travancore.
2393
Substitute.
2394
MEDICINE.
Arrowroot.
2395
FOOD.
Arrowroot.
2396
Benares.
2397Thicken milk
2398PREPARA-
TION OF
ARROWROOT
Travancore.
2399

improvement; it contained a number of extraneous matters, black particles, straw, &c., all of which must be removed by drying. The other two samples, when soaked in cold water, exhibited acidity; they also exhibited a tendency to pass from the insoluble to the soluble form. I may add that the Farm sample also gave the same reaction, but to a less extent. Any unnecessary exposure to the solar heat should be avoided. If the samples could be ground to a fine powder it would add to their value. Immediate conversion into mucilage. Addition of caustic soda about 200 grains (per lb. of water for steeping the pulped roots, in lieu of plain water, this has been found useful in disintegrating and dissolving the nitrogenous matter. Thorough washing in pure spring water will remove all traces of the soda.

The arrowroot is said to be largely manufactured at Cochin, Travancore, and Kanara. Royle says that "a very excellent kind called *tickar* is also made at Patna and Baglupore from the tubers of *Batatus* (*Ipomœa*) *edulis*."

Medicine.—The arrowroot is used medicinally in some parts of the country.

Food.—A good quality of arrowroot is prepared from the tubers especially in Travancore, where the plant grows in abundance. Roxburgh observes that a sort of *starch* or arrowroot-like *secula* is prepared, which is sold in the markets of Benares, and is eaten by the natives. The flour, when boiled in milk, forms an excellent diet for patients or children. It is largely used for cakes, puddings, &c., though after some time it becomes much less palatable and always "a favourite."

The milkmen in Bombay use it to thicken milk which has been watered. The edible properties of the tubers of this plant are alluded to in most of the Settlement Reports of the districts comprising the Central Provinces. Of Seoni it is said they are pounded and made into gruel.

PREPARATION OF THE ARROWROOT.—Drury thus describes the process as practised in Travancore: "The tubers are first scraped on a rough stick, generally part of the stem of the common rattan, or any plant with rough prickles to serve the same purpose. Thus pulverised, the flour is thrown into a chatty of water, where it is kept for about two hours, all impurities being carefully removed from the surface. It is then taken out and again put into fresh water, and so on for the space of four or five days. The flour is ascertained to have lost its bitter taste when a yellowish tinge is communicated to the water, the whole being stirred up, again strained through a piece of coarse cloth, and put in the sun to dry. It is then ready for use."

prepared (505) is thus root made from the bulbs of the *Curcuma angustifolia*, which grows abundantly in the district. It is collected by the Gôtés and Kôis, and rubbed down on a stone, washed, and allowed to settle. It is then dried, and either sold or bartered by them to traders. The *tankar* purchased in the bazars is impure and difficult to refine, as the bulb is not pared before it is grated down. If care be taken, the flour can be made as pure as that prepared from garden arrowroot. It is strange that this root is not made so much use of as it might be, either as an article of food, or even as starch.

Wild Turmeric.

CURCUMA
aromatica.

for export." (For further particulars see the paragraph on Cultivation.)

PREPARATION OF

Central & rosinces).

TRADE IN EAST INDIAN ARROWROOT—Drury says the exports of

TRADE.
2403

Malabar.
2404

dinacea.

Dymock remarks the young tubers at forms one of the East tubers that yield only "colouring matter and later period of growth."

Turmeric,
2405
Starch,
2406

Curcuma aromatica, Salisb; Roxb, *Fl. Ind*, Ed C.B.C., 8.

WILD TURNERIC; YELLOW ZEDOARY, COCHIN TURNERIC.

Syn.—CURCUMA ZEDOARIA, Roxb.

Vern.—*Yangli haldi*, *ban-haldi*, *ban haridra* (*jedwar*?), HIND, *Ban halud*, BENG, *Kapur kachali*, GUZ, *Ran hald*, *ambe haldi*, BOMB, *Kasturi-manjal*, TAM, *Kasturi pasupa*, *kattu-mannal*, TEL, *Anakura kattu-mannar*, MAL, *Vanaharidra*, SANS, *Judwar* (according to Roxburgh), ARAB, *Kasturi-arishina*, KAN, *Duda kaha*, *wal kaha*, SING, *Aiyasandjin*, BURM.

References—Voigt, *Hort Sub Cal*, 593; *Dals & Gibs*, *Bomb Fl*, 274. *Ainslie*, *Mat Ind*, 1, 400, 49 125, U. C. Dutt, *Mat Med Ind*, 769, *Year Book Pharm regarding Pharm Ind*, 240, *clap*, 859.

Habitat—Roxburgh says of his *Curcuma Zedoaria*: "This beautiful species is a native, not only of Bengal (and common in gardens about Calcutta), but is also a native of China, and various other parts of Asia and the Asiatic islands. Flowering time, the hot season, the leaves appear about the same period or rather after, for it is not uncommon to find the beautiful, large, rosy, tufted spikes rising from the naked earth before a single leaf is to be seen." "The plant when in flower is highly ornamental, few surpassing it in beauty, at the same time it possesses a considerable degree of delicate aromatic fragrance."

Bengal
2407

Malabar.
2408

The flowering spikes are quite distinct from the leaf-bearing stems, and the upper bracts of each are more brightly coloured than the lower, and are sterile. Daltzell and Gibson (*Fl Bomb*) say that it is met with in the Concan flowering in May when the leaves begin to appear. Dr. Dymock remarks: "The plant which produces this drug grows wild in the Concan under cultivation it produces central tubers as large as a small turnip. I have had it under cultivation for some years, and observe that the leaves when young have a central purple stain which

Concan.
2409

C. 2409

Wild Turmeric.

CURCUMA
aromatica.

Nepal, "must not be confounded with the word *Nerbisi*, which is the Sanskrit for *Curcuma Zedoaria*." To the hill tribes around Simla and Kulu, at least, it is neither *Jadwār* nor *Nerbisi*, and, indeed, the roots of that plant bear but little resemblance to those of an aconite and none whatever to the rhizomes of a *Curcuma*. But at the same time Dr. Dymock's historic sketch of *Jadwār* and *Zedoaria* is valuable, as there seems little doubt but that many of the early authors made the mistake of viewing these names as

It also
writers
is that
Rum.
is been
(Con-
ar also
Confer-
ly, it would appear to be the
by Flückiger and Hanbury

rhizome oblong or conical, often more than two inches in diameter, external surface dark-grey, marked with circular rings and giving off many thick rootlets; at the ends of some of them are orange-yellow tubers about the size and shape of an almond. The rhizome is palmate.

DESCRIP-
TION,
2417

Dye.—It is probable that this, like the *Zedoary*, was formerly used in the preparation of the *Abir* powder. Dymock says: "Like turmeric its principal use is as a dyeing agent." Mr. Liotard (*Memo Dyeing*) says it is rarely used as a dye. It gives a dirty yellow colour with the alkaline earth *chaux*. Ainslie remarks: "The Native women prize it much from the circumstance that they can give with it, used externally, a particular lively tinge to their naturally dark complexions, and a delicious fragrance to the whole frame."

DYE
2418

Medicine.—The RHIZOMES are used medicinally, being regarded as tonic and carminative. Thwaites says this drug is used by the Singhalese. It holds an important place in native perfumery. Dymock states that "the properties of this drug are very similar to those of turmeric, but its flavour being strongly camphoraceous is not so agreeable. It is used medicinally in combination with other drugs as an external application to bruises, sprains, &c. In the Concan it is applied to promote the eruption in exanthematic fevers; it is seldom used alone, but is combined with astringents when applied to bruises, and with bitters and aromatics to promote eruptions." Ainslie says the Muhammadans suppose it to be a valuable medicine in certain cases of snake-bites, administered in small doses, and in conjunction with golden-coloured orpiment, *kuit* (*Costus arabicus*), and a *kan*.

Cosmetic.
2419
MEDICINE
Rhizomes.
2420

Special Opinions.—*"Used externally in scabs and the eruption of small-pox"* (*Surgeon-Major Henry David Cook, Calcutta, Malabar*). "Rubbed into a paste with benzoin is a common domestic application to the forehead for headache" (*Surgeon-Major John North, I. M. S., Bengal*). "Applied to the forehead in eruptive fevers, and a common"

CURCUMA
aromatica.

Wild Turmeric.

Mysore
2410
Travancore.
2411
HISTORY.
2412

almost disappears when they attain their full size." Drury remarks that it is abundant in the Travancore forests. Of Mysore Mr. D. E. Hutchins says *C. aromatica*, the *Kad arasina*, is collected from the forests all over the province.

History of Jadvār and Zedoary.—The reader is referred to *Aconitum heterophyllum*, (A 401 & 408), for further particulars regarding the use of the Arabic word *Jadvār*. According to certain writers (including Roxburgh) this is applied to a species of *Curcuma*, presumably the present species. To Dr. Moodeen Sheriff we are indebted for the results of much careful study on this subject, the final conclusion arrived at being that the Arabic *Jadvār* is a name which should be restricted to the roots of the non-poisonous *Aconites*. The confusion which exists on this subject Moodeen Sheriff attributes to the resemblance of the word *Jadvār* or *Zadvār* to *Zedoary*. *Dar-hald* and *anbē-haldi*, he adds, are in some Persian works also used as synonymous, but the former is more correctly the name for the medicinal wood obtained from a species of *Berberis*. On the other hand Dr. Dymock (*Ind. Med.*, 1867, W. Ind., 769) writes: "and there appears Avicenna (Lib. II., the present time the Dymock then refers where he states that given to that plant, Dr. Royle was the writer has failed to give to *D. denudatum* that form of *Larkspur* is one of the commonest of herbs, but it bears the name of *Mūnīla* not *Nir-*

2413

to receive a most instructive set of specimens

The *Kala bikk* of the Nepalese (the *Dulingi* of the Bhotias, who make a trade in collecting and selling these roots) is a very poisonous form of *Aconitum ferox*, so poisonous indeed that the Katmandu drug-sellers will not admit they possess any. *Pahlo* (yellow) *bikk* is a less form of the same plant, known to the Bhotias as *Holingi*, while *sen* of the Bhotias) is *A. Napellus*, and

The
for similar purposes and *Gymnathus lob*
root of which is boiled in oil, thus form

2414

Delphinium de...
the Bhotias, Dr. Gimlette says, is used by
e purposes as the *Setho* and *Pahlo bikk*
ianum) is the *Ratho* (red) *bikk* of the

2415

Nepalese, and the *Nirbisi Num* of the Bhotias, and like the *Setho bikk* is
aragana crassicaulis, is
kūrti of the Bhotias, it
affords a root which is employed as a febrifuge. The Nepalese name

2416

that *Delphinium denudatum* is the *Nirbisi* of the earlier writers. It
urges that the "*Nirbishi*," made known by Dr. F. Hamilton as found in

C. 2416

Wild Turmeric.

CURCUMA
aromatica.

Nepal, "must not be confounded with the word *Nirbisi*, which is the Sanskrit for *Curcuma Zedoaria*." To the hill tribes around Simla and Kulu, at least, it is neither *Jadwár* nor *Nirbisi*, and, indeed, the roots of that plant bear but little resemblance to those of an aconite and none whatever to the rhizomes of a *Curcuma*. But at the same time Dr. Dymock's historic sketch of *Jadwár* and *Zedoaria* is valuable, as there seems little doubt but that many of the early authors made the mistake of viewing these names as

wrongly referred by most writers to *Curcuma Zedoaria* of Roscoe (*Confer. Guibourt Hist. Nat. 6me Ed., tom. II, p. 214*) It would appear also that it is identical with the *Cassumunar* described by Pareira. (*Confer Pareira Mat. Med. Vol II, Pt I., 236*) Lastly, it would appear to be the same as the "*Cochin Turmeric*" noticed by Flückiger and Hanbury (*Pharmacographia p 580*)" (*Dymock, 770*)

Description of the Rhizomes.—"Central rhizome oblong or conical, often more than two inches in diameter, external surface dark-grey, marked with circular rings and giving off many thick rootlets, at the ends of some of them are orange-yellow tubers about the size and shape of an almond in its shell, lateral rhizomes about as thick as the finger with a few fleshy rootlets. Internally both central and lateral rhizomes are of a deep orange colour like turmeric, the odour of the flesh root is strongly camphoraceous." Dalzell and Gibson say: "The tubers of the root are palmate"

Dye.—It is probable that the *Curcuma Zedoaria* was formerly used in the preparation of the principal use is as a dye it is rarely used as an alkaline earth *chaula*.

much from the circumstance that they can give with it, used externally, a particular lively tinge to their naturally dark complexions, and a delicious fragrance to their whole frame"

Medicine.—The RHIZOMES are used medicinally, being regarded as tonic and carminative Thwaites says this drug is used by the Singhalese. It holds an important place in native perfumery. Dymock states that "the properties of this drug are very similar to those of turmeric, but its flavour being strongly camphoraceous is not so agreeable. It is used medicinally in combination to bruises, sprains, &c.

tion in exanthematous with astringents when applied to promote eruptions" Ainslie says the Muhammadans suppose it to be a valuable medicine in certain cases of snake-bites, administered in small doses, and in conjunction with golden-coloured orpiment, *kut* (*Costus arabicus*), and *ayúan*"

Scarcely used in the East Indies and the eruption of *ok, Calicut, Malabar*, domestic application to John North, *Is. M. S. I. alga, and a cosmetic*

DESCRIP-
TION.
2417

DYE.
2418

Cosmetic.
2419
MEDICINE
Rhizomes.
2420

CURCUMA
caulina.

Black Zedoary.

TRADE.
2421

(T. Ruthnam Moodelliar, Native Surgeon, Chingleput, Madras Presidency.)

Trade.—"The Bombay market is supplied from the Malabar coast. Value, unpeeled R24 to R25 per candy of $5\frac{1}{2}$ cwt.; peeled R27 per candy" (Dymock).

2422

Curcuma cæsia, Roxb.; Fl. Ind., Ed. C.B.C., 9.

BLACK ZEDOARY.

S

Bengal.
2423
Dinapore,
2424MEDICINE
Rhizomes,
2425

remedy in the fresh state much as turmeric is in this part of India.

Medicine.—C. cæsia is one of the two *Zerumbads* of modern Persian writer. It is not noticed by most Europeans. It is well known and to be found in all the shops. It is the *Common Stam* of Rumphius, and the *Curcuma longa* of Guibourt, who classes it with the turmeric.Cosmetic.
2426

imported into Liverpool under the name of turmeric. It has nearly the same medicinal

TRADE.
2427

horny, The Guibourt appears to have with the turmeric of commerce used externally as an application to bruises, for rheumatic pains, and in contusions.

2428

C. caulina, Graham; Dals. and Gibs., Bomb. Fl., 275.VERN.—*Chazara, chowar*, BOMB.FOOD.
Rhizomes,
2429
Arrowroot,
2430Food.—A form of ARROWROOT is said to be prepared. It is described by Sir George Birdwood and other writers, the last being Mr. Lisboa, who writes: "*Curcuma caulina* grows at Mahabaleshwar and for many years the Chinese ticket-of-leave men used to

value, 3 to 6 pounds to the rupee. But they never used it except in extreme scarcity."

C. 2430

CURCUMA
longa.

Turmeric.

CULTIVATION.

140: Year Book Pharm., 1873;
 Mason, Burma, 513, 863; Man
 Baden Powell, Pb Pr., 290, 380,
 Drury, U Pl., 169; Lisboa, U Pl.
 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

Condiment
Form
2434
Dye Form.
2435

Habit for its
rhizomes diment
with curry-stuffs and also as a dye, and is one of the most profitable of
crops The dye-yielding rhizome is harder and much richer in colour
than the edible. These conditions are thus special adaptations which
possibly point to an ancie
species of *Curcuma* are
appear to have been mi
positive character that would justify the supposition that *Curcuma longa*
itself is a native of India Simmonds (*Tropical Agriculture*, p 383)
says. "The *Curcuma longa* grows wild in the province of Mysore, and
is probably indigenous to various other parts" On the other hand,
Roxburgh and all botanical writers of
Ainslie even remarks that "The *Curcu*
China, and is there called *Kueng huy*
list of its medicinal virtues in *lepra*.

also names for it in
be offered that it is
s which may have
in use and which
rue arrowroot plant
species Datzell and

CULTIVATION

CULTIVATION, YIELD, AND SOIL.

...the most complete accounts
of the system of the
burgh. This may be
modern systems "The

ground
rainy
often
deeme
of we
rains t
twenty
cutting
tops o
requir about from nine hundred such sets, and yields in December and
January, about two thousand pounds weight of the fresh root. The
Department of Bengal (*Ann. Rep., 1836, p. LV*) publishes
a modern system of turmeric culti-
two varieties grown—one known
as the Patna variety. The latter
is of a richer colour and gives a better outturn. Loamy soil, even of a
very inferior quality, will grow turmeric. It can be grown in shady

DASHL
2438

C. 2438

CURCUMA
longa.

Turmeric.

CULTIVATION

N. W. F.
Cost.
2446
Profit.
2447

roots of turmeric, to the amount of 250lb to the acre, are then planted, one to the square foot, and so much water do they require that trenches have to be dug through the whole field only one foot apart. After the rains it has to be watered every week. The roots are ready for digging up in January."

BOMBAY.
2448
Yield.
2449

Of Bombay it has been stated—"In Gujarât and Kaira it is planted towards the higha." parts of Bom- ter abundant," "An average crop will give a return equal to sugarcane, viz., ₹100 per several kinds, the in dyeing is the dicine is "highly

Lokhandl.
2450
Aromatic.
2451
PANJAB.
2452

row in the Panjâb; at the Panjâb cultivation. d requires much care red till the end of Nov- frequently along the

2453

2454

considered quite as female that it occupies the soil for six months only. A few localities supply turmeric for the consumption of the whole district." The Gazetteer further states that in the Kangra District there were, in 1880-81, 1,621 acr

MADRAS.
2455

is alluded to in various publications icle has been found that deals with the before it is stated that it is usually grown as a mixed crop with yams, maize, castor, brinjal, onions, &c. "The soil is thoroughly prepared by repeated ploughing and heavy manure, municipal sweepings and ashes being a favourite manure."

thenceforward somewhat less when the plants are dug up. The crop is hoed and weeded several times in the first four months. The other crops are variously planted; the onions on the

CURCUMA
longa.

Turmeric.

PREPARA-
TION.
PANJAB.
2462
MADRAS.
2463

the roots are soaked in lime juice and borax before being powdered instead of being boiled" Of the Panjáb, Mr Baden Powell says the tubers are taken up in November and dried partly by the action of fire and partly by exposure to the sun Of Coimbatore it is reported: The roots are carefully sized and separately boiled in a mixture of cow-dung and water, dried and sent to market."

AREA
2464

AREA UNDER TURMERIC.

Trustworthy particulars cannot be learned regarding the total area in India annually under this crop, but from the extensive uses of the tuber and the remunerative nature of the crop, it may be inferred to be very much more extensive than shown in the published returns. The following shows the acreage returned as under this crop:—

| | | | | | | | | | |
|------------------------------------------|---|---|---|---|---|---|---|---|--------------|
| | | | | | | | | | Acres. |
| Bengal (according to Dr. McGann) perhaps | . | . | . | . | . | . | . | . | 30,000 |
| Madras : | : | : | : | : | : | : | : | : | 15,000 |
| Bombay : | : | : | : | : | : | : | : | : | 6,000 |
| Barar : | : | : | : | : | : | : | : | : | 2 000 |
| Panjab : | : | : | : | : | : | : | : | : | <u>2,500</u> |
| TOTAL | . | . | . | . | . | . | . | . | 55,500 |

TRADE.
2465

TRADE IN TURMERIC

Regarding the Indian Foreign trade in this article Mr O'Connor, in his Review of the Trade in 1875-77, wrote "Turmeric was exported to the value of 10½ lakhs of rupees, the quantity being 123,824 cwt. This article has hitherto been recorded in the returns under the heading 'Spices,' but it is more appropriately classed as a dyeing material. It is not really a spice but rather a condiment, and for this purpose it is very largely used in India, but it is also extensively employed as a dye, and almost all of that which is exported from this country is used as a dye. It is mostly exported from Bengal to England, France, and the

Foreign.
2466

and as compared with previous years, the article was no longer of importance. In 1881-82 the exports were 70,783 cwt, valued at Rs. 3,66,047, as compared with 1877-78, when they amounted to Rs. 24,40,189. In 1885-86 the trade had so far recovered itself that the exports amounted to 156,287 cwt, valued at close on 14 lakhs of rupees. Last year they amounted to 140,904 cwt, valued at Rs. 10,32,025.

Internal
2467

Full particulars cannot be learned as to the extent of the internal trade, but it must be very extensive, and even a trans-frontier trade exists, Kashmir receives a considerable amount. The various Indian ports last year exchanged 281,117 cwt. of turmeric valued at Rs4,38,260.

HISTORY
2468

HISTORY OF TURMERIC

Turmeric yields a yellow dye of a fleeting character, which formerly was far more extensively employed by the natives of India than at the present day. Its chief features that recommended it for decorative purposes at marriage ceremonies, &c., were cheapness, ease of preparation, and facility of being removed. But these are conditions even more readily attained by aniline colours, while glaringly brilliant results are obtained, and, consequently, even religious injunctions have

Turmeric.

CURCUMA
longa.

to a certain extent given place to the encroachments of the tar dyes. Writing of this subject Dr. McOann (*in his Dyes and Tans of Bengal*, p. 85), says: "Formerly on festive occasions an infusion of turmeric

HISTORY.

Wedding
Garments.
2469

entire, or the corners, of every new article of dress, whether of man or wo-

Cosmetic.
2470

prepare their yellow *tiruchurnum*, with which they make the peculiar mark on their foreheads."

Markings on
Foreheads.
2471

Sir E. C. Buck, in the *Dyes of the North-West Provinces*, says: "The dye given by turmeric is of a dull yellow colour; it is fleeting, and, except in dyeing the commoner sort of cloth, is seldom used, except in

Dye Fleeting.
2472

be rendered permanent as a dye" It is somewhat remarkable that John Huyghen Van Linschoten, who spent several years on the Malabar coast from about the date of 1596, should describe the races of people he met with, going into every detail as to their social habits, domestic and agricultural life, marriage customs, agricultural produce, and industrial productions, but should make no mention of turmeric. He describes Cardamoms, Cumin seed, Galangr, Pepper, Cubebs, Tamarind, Ginger, Mangos, &c, &c; but while discussing the preparation of curry and chutney makes no mention of the habit of eating turmeric or of dyeing garments with it. This might be accepted as pointing to its use having been much less general in these days (at least on the Western side of India) than at the present time. On the other hand, an ancient cultivation in India is clearly indicated by the frequent mention of the plant in the early literature of the Hindus, and by the fact that there are several well recognised or distinct cultivated forms of the plant. Garcia de Orta, who lived in Goa in 1563 (or shortly before Linschoten), describes under the name *Crocus indicus* a tuber which appears to be turmeric, and Dioscorides mentions an Indian plant as a kind of Cyprus (*Κύπριος*) as resembling ginger, but having when chewed a yellow colour and bitter taste. This was most probably turmeric, but it must not be forgotten that several other species of *Curcuma* afford a yellow colour that indeed it is probable some of the so-called forms of *C. longa* may prove the tubers of different species

nizable by mere verbal descriptions. The principal sorts now in commerce |

C. 2472

CURCUMA
longa.

Turmeric.

HISTORY.

Cochin
Doubtfully
True Tur-
meric
2473are known as *China*, *Madras*, *Bengal*, *Java*, and *Cochin*. Of these the

"*Curcuma longa*" is the most common. It is cultivated in the
 "Cochin" and "Madras" provinces. The "Bengal" and "Java" forms are
 "Curcuma zeylanica" and "Curcuma alba". The "Cochin" form is
 "Curcuma longa".

"Country as *turmeric*, though its starchy tubers are employed to make a
 "arrowroot" (Conf with *C. angustifolia* and other sources of East India
 arrowroot)

TURNERIC DYE.

DYE
2474
Dye-Yielding
Rhizomes
2475

Dye — It has already been stated that a special form of turmeric is
 grown for this purpose, namely, a harder root, much richer in the dye
 principle than in the ordinary condiment form. This dye rhizome
 receives separate names in the various provinces of India, but is most
 generally known by the name *lok handi haladi*, other dye forms are
 as *maia-haldi*, *jowala-haldi*, and *amba-haldi*. Under the paragraph,
 above devoted to an account of the preparation of the tuber, mention has
 also been made of the further process which the dyer has to adopt in
 preparing his infusion. The employment of borax, in Kumaon, will be
 found to have a very considerable interest, since the system there pur-
 sued, and doubtless accidentally discovered, is dependent on an import-
 ant chemical feature of the dye principle.

The colour is only deposited in the rhizome with age, and hence, in all
 probability, the above mentioned forms have been obtained by a process
 of careful selection of stock observed to produce the colour freely. It
 is of importance, however, that the European merchant, in purchasing
 for dye purposes, should see that he gets the hard dye-yielding form and
 not the softer aromatic condition which is used as a condiment. Al-
 though, of course, turmeric is still employed by itself as a simple and
 cheap dye, its more general use at the present day in India, is as an
 auxiliary to other dyes and in Calico printing. It is also used to some
 extent to impart a colour to native-made paper. Mordants are but
 rarely required with the dye, as it is found to attach itself readily
 enough to wool, silk, or cotton. Alkalies deepen the colour, making
 it almost red. Alum is said to purify the colour and to destroy all

brilliant yellow, known
 (Carbonate of Soda)
 this process "Here
 tint, produced always

where an alkali dye is used. It is sometimes em-
 ployed to form a compound colour in which turmeric
 is formed along with indigo
 dipped in a solution of *haldi*
 to brighten other colours, as,
 ristic), lac dye, *al* (Morinda
 and *toon* (*Cedrela Toona*).

Yellow.
2476Green.
2477

Turmeric.

CURCUMA
longa.

The Indian Calico-printers use turmeric by preparing a mixture of "4 gallons of water containing pomegranate rind and alum in the following proportions:—Turmeric 5lb, pomegranate rind 2lb, and alum 1½lb. The compound is left to stand for a night, the surface water strained off, and ½lb of indigo added. It is then prepared for use by being thickened with gum, clarified butter, and flour in the usual way. The colour is greenish yellow and is fleeting." (*Buck, Dyes and Tans of N.-W. P.*, 55.)

CALIC
PRINTING.
2478

EUROPEAN
USES.
2479

cially by the wool and silk dyers for the production of compound shades—olives, browns, &c. It gives a bright yellow colour without the aid of a mordant but has moderate use with it it yields other colours.

Cotton.
2480

Wool.
2481

colours produced
as wool." (*Dye-*
colouring matter of
l, ether, and fatty
lution of turmeric

Silk.
2482

is thrown down, by the addition of tin crystals, as a red precipitate; by acetate of lead, a chestnut brown; by mercury salts, reddish-yellow; salts of iron colour the tincture brown, alkalies turn it brown; weak acids do not act upon the pigment, which is turned red by concentrated acids. The colouring matter of turmeric has received the name of *Curcumin*.

Curcumin.
2483

"M. E. Schlumberger has been the first to investigate the modifying action of boracic acid upon *curcumin*. It is well known that turmeric paper becomes brown under the joint influence of the boracic and any mineral acid, preferably the hydrochloric. Ammonia turns this colour blue. When an alcoholic solution of curcumin is boiled with boracic acid its colour turns orange, and upon the addition of water to the previously cooled solution a vermillion-coloured powder is thrown down, being a

Action of
Boracic Acid.
Red color.
2484

stance so deposited is first washed with dilute alcohol, next with pure water, in order to eliminate all boracic acid; the residue is dried, and next dissolved in a boiling mixture of 2 parts of alcohol and 1 part of acetic acid. This fluid, being filtered while hot, deposits on cooling rosocyanin, while the pseudo-curcumin remains in solution. By pseudo-

Rosocyanin
2485

C. 2485

CURCUMA
longa.

Turmeric.

HISTORY.

Cochin
Doubtfully
True Tur-
merico
2473

are known as *China, Madras, Bengal, Java, and Cochin*. Of these the first named is the most - in the European market. Linschoten wrote, so that it must have been exported from other parts of India or from other tropical countries. Filiciger and Hanbury say of the Cochin Turmeric of the present day that it "is the produce of some other exclusively of a bulb-shaped root, the inner substance is horny and of a deep orange-brown, the outer is yellow." Mr. A. Forbes Scaly sends us (1873) living rhizomes of this grown at Alwaye, north east of Cochin, and is never used in the country as turmeric, though its starchy tubers are employed for making arrowroot" (Conf with *C. angustifolia* and other sources of East India arrowroot).

DYE
2474
Dye-Yielding
Rhizomes.
2475

TURNERIC DYE

Dye — It has already been stated that a special form of turmeric is grown for this purpose, namely, a harder root, much richer in the dye principle than in the ordinary condiment form. This dye rhizome receives separate names in the various provinces of India, but is most generally known by the name *lok handi haldi*, other dye forms are as *mala-haldi*, *jowala-haldi*, and *amba-haldi*. Under the paragraph, above devoted to an account of the preparation of the tuber, mention has also been made of the further process which the dyer has to adopt in preparing his infusion. The employment of borax, in Kumaon, will be of considerable interest since the system there our-

Yellow.
2476

probability, the above mentioned forms have been obtained by a process of careful selection of stock observed to produce the colour freely. It is of importance, however, that the European merchant, in purchasing for dye purposes, should see that he gets the hard dye-yielding form and not the softer aromatic condition which is used as a condiment. Although, of course, turmeric is still employed by itself as a simple and cheap dye, its more general use at the present day in India, is as an auxiliary to other dyes and in Calico printing. It is also used to some extent to impart a colour to native-made paper. Mordants are but rarely required with the dye, as it is found to attach itself readily enough to wool, silk, or cotton. Alkalies deepen the colour, making it almost red. Alum is said to purify the colour and to destroy all shades of red. The dyers of Calcutta produce a brilliant yellow, known as *basanti rang*, by mixing turmeric with *Sajmati* (Carbonate of Soda) and lemon or lime juice. Dr McCann remarks of this process "Here the acid is apparently used to correct the red tint, produced always where an alkali acts on turmeric." Myrabolams are sometimes employed with turmeric, but the chief compound colour in which turmeric plays an important part is the green shades formed along with indigo and then dyed in a solution of *haldi*.

Green.
2477

other colours, as, dye, al (Morinda edreia Toona).

Turmeric.

CURCUMA
longa.

The Indian Calico-printers use turmeric by preparing a mixture of "4 gallons of water containing pomegranate rind and alum in the following proportions:—Turmeric 5lb, pomegranate rind 2lb, and alum 1½lb. The compound is left to stand for a night, the surface water strained off, and ½lb of indigo added. It is then prepared for use by being thickened with gum, clarified butter, and flour in the usual way. The colour is greenish yellow and is fleeting." (*Buck, Dyes and Tans of N.-IV. P., 55.*)

CALIC
PRINTING.
2478

The rhizome is still largely used by the European dyers, though the fluctuations in the trade may be viewed as due to the development of the aniline industry. Professor Hummel says of it:—"Notwithstanding the very fugitive character of the colour it yields, it is still much used, espe-

EUROPEAN
USES.
2479Cotton.
2480Wool.
2481Silk.
2482Curcumin.
2483Action of
Boracic Acid.
Red color.
2484Rosocyanin
2485

C. 2485

perature than flow then be- into solution. is somewhat

brighter, and in the latter case more orange. With the use of potassium dichromate and ferrous sulphate as the mordant, the colours produced are olive and brown. Silk is dyed in the same manner as wool." (*Dyeing of Textile Fabrics, 367.*) Crookes says:—"The colouring matter of turmeric is very sparingly soluble in water, but alcohol, ether, and fatty and essential oils dissolve it readily. The alcoholic solution of turmeric is thrown down, by the addition of tin crystals, as a red precipitate; by acetate of lead, a chestnut brown; by mercury salts, reddish-yellow; salts of iron colour the tincture brown, alkalis turn it brown; weak acids do not act upon the pigment, which is turned red by concentrated acids. The colouring matter of turmeric has received the name of *Curcumin*."

"M. E. Schlumberger has been the first to investigate the modifying action of boracic acid upon *curcumin*. It is well known that turmeric paper becomes brown under the joint influence of the boracic and any mineral acid, preferably the hydrochloric. Ammonia turns this colour

inasmuch as it does not yield a red colouration with boracic and hydrochloric acids, and on being dissolved in alkalis gives a greenish-grey

coloration. The boracic acid of curcumin dissolves with a pur- to grey. When hydro- romo-curcumin, and the on cooling a new body in solution. The sub-

stance so deposited is first washed with dilute alcohol, next with pure water, in order to eliminate all boracic acid, the residue is dried, and next dissolved in a boiling mixture of 2 parts of alcohol and 1 part of acetic acid. This fluid, being filtered while hot, deposits on cooling rosocyanin, while the pseudo-curcumin remains in solution. By pseudo-

CURCUMA
longa.

Turmeric.

EUROPEAN
USES

curcumin is understood the organic resinoid substance resulting from the prolonged action of water upon boro-curcumin, just above-mentioned. The rosocyanin is first dried and next treated with ether, in order to remove the last traces of yellow colouring matter: thus purified, it is a crystalline substance, of a cantharides-like lustre, insoluble in water, ether, and benzol, but very soluble in alcohol, to which it imparts a most magnificent deep rose-red, quite comparable to fuchsin solutions. This fluid becomes permanently yellow on being boiled. Ammonia turns the alcoholic solution of curcumin into a blue colouration, which on dilution with water changes the alcoholic solution red.

Blue Color.
2486Colouration of
Flowers
Cyanin.
2487

The relations existing between curcumin and rosocyanin (also called rosocyanin) and pseudo-curcumin are unknown, neither was, until July, 1870, the true composition of curcumin known. It is very probable that the phenomena of colouration is exhibited by curcumin, which turns red and blue, and then yellow again, under the action of comparatively weak reagents, bear a relation to certain phenomena observed with flowers.

"It is not impossible that there are some of the same chemical with the red coloration." M M Fremy and C. alkalis. If this suggestion proves correct, on more precise investigation turmeric could become a useful source of preparation of the red colouring matter of flowers, which it is very difficult to obtain by direct extraction.

Printing
Silks
2488
Sour Browns.
2489
MEDICINE,
2490

After its want of permanence in the air, it is now employed to a vast extent in stuff-dyeing, forming an important constituent in certain compound colours, especially the so-called "sour browns".

1
catarrh and purulent ophthalmia

A paste made of the flowers is used in ringworm and other parasitic skin diseases. Dymock says the Muhammadans "use turmeric medicinally in the same manner as the Hindus, they also prescribe it in affections of the liver and jaundice on account of its yellow colour." "The editor of the *Pharmacopœia of India* speaks favourably of the use of a decoction of turmeric in purulent conjunctivitis, he says it is very effective in the fumes of burn-mucous discharge, it is "given by the native doctors in the diarrhoeas which are so troublesome and difficult to subdue in atonic subjects." Baden Powell remarks that it is employed in "intermittent fevers and dropsy." "It contains much essential oil and

powdered is given in
con F. Anderson, M B,
powdered haldi over
burnt charcoal will relieve scorpion sting when the part affected is exposed to the smoke for a few minutes. A paste made of fresh rhizome is applied on the head in cases of vertigo. Fresh juice is cooling. Fumes of burning root is employed during hysteric fits" (Assistant

Turmeric; Long and Round Zedoary.

CURCUMA
Zedoaria.

Surgeon T. N. Ghose, Meerut) "Turmeric and alum, in the proportion of one to twenty, is blown into the ear in chronic otitis media" (Dr. Barasha)

MEDICINE.

is
pa
to
or
powdered root is used as a fumigation in commencing catarrhs. The inhalation is generally taken at night and no fluid is allowed for some hours afterwards. The effect is said to be in many cases a complete cure of cold" (Narain Mitter, *Kethe Bazar Dispensary, Hooshangabad, Central Provinces*) "Curcuma longa, the *Mungol* of Tamil, powdered and mixed with warm milk and pepper water, is a good remedy for fever" (Surgeon-Major water to a soluble consistent deep-brown colour) forms sprains. Pure turmeric is lumes of the burning root This disease is believed to be treated with mantras while

and is used for colouring confections, &c.

Chemistry of Turmeric.—Dr. Dymock gives a brief sketch of the chemical history of this subject which should be consulted "Curcumin, the yellow-colouring matter of turmeric, has been examined by several chemists, whose experiments have led to the conclusion that its formula is either $C_{11}H_{11}O_2$ or $C_{11}H_{11}O_3$, that it melts at 172° , forms red-brown

FOOD.
Condiment.

2491

Curry

Powder.

2492

CHEMISTRY.

2493

Curcuma pseudo-montana, Graham

Verb.—*Sinderwani, sinderbur, sindetwan, hellounda, Bonn*

Habitat.—Said to be a native of the Konkan, springing up at the beginning of the rains.

Food.—"The tubers, which are perfectly white inside, are boiled and eaten by the people during seasons of scarcity. Perhaps this plant, too, yields a part of East India arrowroot, that which comes from Ratnagiri is manufactured from its tubers" (*Lisboa; Dalz. and Gibs*).

- 2494

C. rubescens, Roxb.

Habitat.—"A native of Bengal, flowering time in the months of April and May, soon after which the leaves appear, and decay about the beginning of the cool season, in November. Every part has a strong but pleasant aromatic smell when bruised, particularly the root." (*Roxb*)

Food.—Roxburgh and Voigt say the pendulous tubers of this species yield a form of arrowroot

FOOD.

Rhizomes.

2495

Arrowroot.

2496

2497

FOOD.

Arrowroot.

2498

2499

C. Zedoaria, Roscoe (non-Roxb.); Wight, *l.c.*, t. 2005.

THE LONG AND THE ROUND ZEDOARY.

Syn.—C ZERUMSET, *Roxo*

C. 2499

CURCUMA
Zedoaria

Long and Round Zedoary

Vern — *Kachura*, HIND; *Sati*, *short*, *kachura*, BENG. *Sati*, *kachura*, SANS. *Zurambdā*, ARAB. *Kashur*, *uruk el kafur*, PERS., *Kathura* BOMB. *Kich-chilik-kishanghu*, *pulān kishanga*, TAM. *Kich-chiugaddala*, *kachōram*, TEL. *Kach chōlam*, *kach churi kishanna*, *pulā-kishanna*, MAL. *Kachōrd*, KAN. *Thauw-wen*, BURM. Fleming, Ainslie, &c., call this the *Nirbisi* of Sanscrit writers

Fleming, *Ansing*, Oct., 1882, *the* *Nirxist* of Sanscrit writers
 274; *Gibbs*, *Bomb* *Fl.*,
 232, 68, *Pharm* *Ind.*,
Dispe, haughnessy *Beng*,
Mot, 127, *U. C* *Dutt*,
 771, *W* *Ind* *2nd* *Ed.*,
U S Dispens, 15th *Ed.*, 1782, *L L Dey*, *Beng* *Drugs*, 45, *Murray*,
Pl and Drugs, *Sind*, 21, *Kanaga* *Gas*,
I, 159, *Medical* *Top* *Aj*, *Pharm*,
Ind 240, *Baden* *Pome*, 170,
Birdwood *Bomb* *Pr*, 87, *to the*,
Mus of Ec *Est*, 62

Habitat — Roxburgh says it is a native of Chittagong, from which place it is extensively cultivated in many parts to Ainslie, it is "a native of the East." In the Kangra Gazetteer (t. p. 159), it is said to be native of the whole district, but in very small quantities.

**ABIR
2500**

Abir—The red powder, *Abir*, used by the Hindus at the Holi festival,

Bengal, for the preparation of the *Abir* powder, but I suppose reversed the scientific names of the species of *Curcuma*. The *Shat* has, for the past forty years, been regarded as *C. Zedoaria*, *Roscoe*, while Dr McCann gives it as *C. Zerumbet*, *Linn*—a name which does not exist in botanical literature. If he means *C. Zerumbet*, *Roxb*, not *Linn* (a synonym for *C. Zedoaria*, *Roscoe*) it is unfortunate he did not publish his economic information under the modern name, since the name

250r

to colour flour composition In Bengal the root-stocks of *C. Zedoaria*, *Roscoe*, are used and apparently as the entire representative of the *Abir* powder of Upper and Western India The Zedoary is also an ingredient in *Ghus*, *Abir* along with cloves cardamoms, deodar, *Artemisia* and *Cerasus* The

Zedoary
2502

horny internally, having a bitter taste, like that of the long Zedoary, which it also resembles in odour. The odour of both drugs is analogous with that of ginger, but weaker unless the ^{herb} ~~herb~~ be powdered when it develops a powerful aromatic odour

MEDICINE
Rhizomes.
2503

C. 2503

chitis" (Civil Surgeon J. H. T. Cotton, B.A., M.B., Hongkong)

Note—The writer suspects that some of the above is *Andropogon*.

Linn., *sp. Pl.* 430

Perfumery—The rhizomes of this plant constitute one of the most important articles of native perfumery.

Trade—Dymock says the Bombay supply comes from Ceylon, Rs. 20 to Rs. 30 per candy of 7 cwt. as already stated. Roxburgh adds that Bengal gets its supply from Chitragong.

Curcuma Zerumbet, Roscoe (non-Roxb.)

The writer is unable to isolate the economic facts recorded by certain authors under this name from those given for *Curcuma Zedoaria* and he suspects that all refer to one and the same plant, or to Roxburgh's Zingiber Zerumbet.

CUSCUTA, Linn., *Gen. Pl.*, II., 881.

Cuscuta reflexa, Roxb.; *Fl. Br. Ind.*, IV., 255. CONVOLVULACEÆ

THE DOBBER

Syn.—*C. GRANDIFLORA*, Wall.; *C. VERUCOSA*, Sweet

Vern.—*Halat*

C

S

L

CYANOTIS
tuberosa.

The Spider-worts

noticed. It occupies there more than ten times as large an area as in any other Division. The cultivation of guar also reaches its maximum in the same tract, and is an indication of the care of agricultural stock which one would be glad to see extended to other parts of the provinces

"Guar is sown at the commencement of the rains and is cut in October. Its average produce of dry pulse to the acre may be taken as 10 maunds"

Mr. Baden Powell says of the Panjáb: "Gujarat is the only district in the Panjáb proper which exhibits a sample; the pulse is stated by the

bell says the Santals eat the fruit.

CYANANTHUS, Wall.; Gen. Pl., II., 557.

2520

Cyananthus, sp. (P C Knafolins, Wall.); Fl. Br. Ind., III, 434; [CAMFANULACEÆ.

Vern.—Murra, Pb.

Habitat—"A plant with pretty blue flowers, growing at 10,000 to 12,000 feet in Chumba"

MEDICINE.
2521

Medicine—"The calyces are eaten, being mawkish sweet, and are said to be good for asthma." (Stewart, Pb Pl)

CYANOTIS, Don; Gen Pl, III, 851; Wight, Ic., t. 2082 & 2089.

2522

Cyanotis axillaris, Ram. et Schultes; DC., Mono. Phan, III., 244; Clarke's Commelinaceæ, table 35; COMMELINACEÆ.

ONE OF THE SPIDER-WORTS.

Vern.—Nirpuli (Rheede), TAM; Soltraf, bagha-nulla (Ainslie), HINDI Isaka (Lisboa); BOMB.

MEDICINE.
2523

... in many parts of India; dis-

... it is viewed as a ... (1st Ed, Mat. Med, W. India, 680, omitted from 2nd Ed) that although the plant is not uncommon in the western Deccan he has not known it to be used medicinally.

FAMINE
FOOD.
Seeds.
2524
2525

... of the plant ... an Hamilton, ... in cases of ascites especially when mixed with a little oil Lisboa says that the seeds of this, as also of Commelina communis, were eagerly sought for during the Bombay famine; they are wholesome and nutritious

C. tuberosa, Ram & Schultes; DC., Monogr., Phan, III., 249

Syn.—TRADESCANTIA TUBEROSA, Roxb., C. ADSCENDENS, Dals. in Hook Jour Bot p 343 (1857); C. SAKMENTOSA, Wight, Ic, 2067.

MEDICINE.
Root.
2526
FOOD.
Leaves.
2527

Vern.—Merau chunchi (a name given from the resemblance of the roots to the papille of the goat), Hoda jereng arak' (the vegetable), SANTAL.

C. 2527

SEIR FISH; Cycas or Sago Plant.

CYCAS
Rumphii.

CYBIUM, Cuv., Day, Fishes of Ind., 254.

Cybium Commersonii, Cuv. & Val.

SEIR FISH.

Vern.—Sarmoyi, HIND, Vunjurum (male), konam (female), TEL, Konam, mah-wu-luachi or ah ku-lah, TAM, Chumbum, MAL

Habitat.—Seas of India, East coast of Africa, and Malay Archipelago

Medicine.—An OIL is prepa

2528

MEDICINE.
OIL
2529

CYCAS, Linn; Gen Pl, III, 444

2530

The brief notices here given of the species of CYCAS will be found supplemented under Sago. This has been rendered necessary, from its being often difficult to discover to which plant the earlier writers refer

Cycas circinalis, Linn; DC Prod XVI, II, 526, CYCADACEÆ.

2531

Syn.—C SPHERICA, Roxb, Fl Ind Ed C.B.C., 709, C CIRCINALIS, Linn. in Thaisites En Ceylon Pl, 294, TODDER FANNA, Rheede, Hort Mal, III, 9

Vern.—Thakal, NEPAL, under Cycas circinalis, Linn, fer to Sago and hawal, DUK, tnhme, SINO.

Habitat.—A palm-like tree met with on the mountains of the Malabar coast and in Ceylon

Food.—The SEEDS are ground into flour and used as food in times of scarcity. "The FLOUR obtained from the seeds of this species is made into cakes and eaten by the Cinghalese, and is reputed a remedy for some disorders" (Enumeratio Plantarum Zeylanicæ, 294)

FOOD.
SEEDS.
2532
Flour.
2533

C. pectinata, Griff., as in Kurz, For. Fl Burm., 503

2534

Vern.—Thakal, NEPAL

Habitat.—An evergreen simple-stemmed, palm-like tree, found in Sikkim, Eastern Bengal, and Burma, often in sal or eng or pine forests (Gamble)

Food.—Yields a coarse sago, which, with the fruits, is eaten by the hill-people in Sikkim (Gamble)

FOOD
SAGO.
2535
TIMBER.
2536

C. revoluta, Thunb

2537

Often called the SAGO-PALM OF JAPAN AND CHINA

Habitat.—A Japanese species often cultivated in India, has a short thick stem

C. Rumphii, Miq, Gamble, Man Tirib., 415

2538

Syn.—C CIRCINALIS, Roxb., Ed C.F.C., 709

Vern.—Hara-gudu, TEL., Talia waram, MAL; M. n. jang, FLEM

C. 2538

CYDONIA
vulgaris.

Cycas; Quince

in stem; abundant
Isl. n and Andiman

RESIN.
2530
MEDICINE.

that it excites suppuration in an incredibly short time
Special Opinion — } "The scales of the cone of the male tree, anodyne,
dose 30 to 60 grains or more" (Apothecary Thomas Ward, Madanapalle,
Cuddapah).

2540
Scales.
2541
FOOD.
Sago.
2542
Seeds
2543
2544

Food.—The interior of the stem yields a good quality of sago or
starch, the nutty seeds are in Ceylon made into flour, but they are also
eaten by the hill tribes of India.

Cycas siamensis, Miq.; Kurz, Burm For. Fl., II., 503

Habitat.—An evergreen, low, stemless, palm-like tree frequent in the
eng and dry forests of the Prome district, Burma

RESIN.
2545

Resin.—Exudes a peculiar whitish gum, like fragranth. (Kurz)

CYDONIA, Tourn (PYRUS, Linn); Gen Pl, I., 626.

2546

Cydonia vulgaris, Pers; Fl. Br. Ind, II, 368; ROSACEE.

THE QUINCE.

Syn — PYRUS CYDONIA, Linn

Vern — Bihl (abi, according to Ainslie), Hind, Bam tsáiná, bamsuta,
seeds —
i, PERS,
dalimda-

References — Brandis, For Fl, 205 • Gamble, Man Timb, 161 • Steuart,
Pb Pl, 80; DC, Origin Cult Pl, 235, Home Dept cor regarding
Pharm Ind., 221, Ainslie, Mat Int, I, 332, Mooden Sheriff, Supp
Pharm Ind 211, Dymock, Mat Med W Ind, 2nd Ed, 302, Bent
& Trim, Med Pl, I, 106, S Arjun, Bomb Drugs, 52, Irvine,
Mat Med Patna 10, 106 Baden Powell, Pb Pr 347, 597, Lisboa,
U Pl Bomb, 119, Birdwood, Bomb Pr, 32 Pliny, lib, XV, Cap
XI (Quince used in his day was brought from Crete)

Habitat.—Cult

up to 5,500 feet in the woods in the
north of Persia, r to the south Cauca-
sus and in Anatolia Naturalization may be suspected in Europe No
Sanskrit name is known for the quince, neither is there any Hebrew name,
but its Persian name is Huvah aiva is the Russian for the cultivated
quince, and for the wild plant as

to an ancient knowledge of the
DeCandolle adds that it may
the epoch of the Trojan War (Orig Cult Pl, 237)

OIL
2547

Oil — Baden Powell mentions this
of Panjab Products Docyma indica,
plentiful in Sikkim, Bhutan, Khasia
Hills the ground at certain seasons is simply covered with the fruit left
rotting under the trees This might easily be put to some economic

MEDICINE
Seed
2548

which is found in
idan practitioners,

Quince.

CYDONIA
vulgaris.

MEDICINE.

monly eaten as a FRUIT by the Arabs and Persians, and are considered tonic, cephalic, and cardiacal; they are also eaten baked. The LEAVES, BUDS, and BARK of the tree are domestic remedies among the Arabs on account of the astringent property.

Fruit.

2549

Bark.

2550

Mucilage

2551

corresponds in composition with that of linseed "

armacographia)
forms a pleasant
cases of irrita-
Rai, Moollan)

about one drac
are known here
plaints and see
Ahmedabad).

then strained &
drink which if sweetened and iced is most useful in cases of diarrhoea for young and old (Surgeon G. F. Poynder, A.M.D., Roorkee)

Food—When ripe the FRUIT is eaten, it is sweet, slightly juicy and astringent. It is also made into preserve, and, as having a powerful odour, is often used to flavour marmalade and other preserves. Wine is sometimes made from it. It is supposed by some to have been the Golden Fruit of the Hesperides. It is largely grown in Kangra (especially near Naggar), and the fruit is used in making preserves (Gas, p. 37). It is also cultivated to some extent in the Peshawar Valley and at Lahore. Stewart says it is common in Kashmir, where the fruit is said by Vigne to be very fine. Cayley states that a small quantity is exported from Kashmir into Tibet. Abundant in Afghamistan, whence fruit and

FOOD.

Fruit.

2552

no other fruit of remarkable goodness.) Anclison in his *Aurum Valley Flora* makes no mention of this plant.

Trade—Dymock says "Quince seeds are imported into Bombay from the Persian Gulf and Afghanistan. Value Rs 10 to Rs 25 per Surat maund of 37½ lb, according to quality." Moodeen Sheriff points out that *Beh-dānah* and *Be-danah* are so much alike in sound that mistakes are likely to be made. The latter is the name for a peculiar seedless raisin but is often loosely applied to all raisins.

TRADE

2553

Cymbopogon, see Andropogon, GRAMINEÆ.

C. citratum, DC, see Andropogon citratus, DC, A. 1079

C. laniger, Desf, see Andropogon laniger, Desf; A. 1093

C. Martini, Roxb., Munro, see Andropogon Schoenanthus, Linn; A. 1117

C. 2553

CYDONIA
vulgaris.

Cycas; Quince.

Habitat.—A branched stem; abundant in the Malabar Islands. Often Tenasserim and Andaman

Resin.—Exudes a good sort of
Medicine.—Kurz says the r

that it e
Spec
dose 30

Cuddapatt).

Food.—The interior of the stem yields a good quality of sago or starch; the nutty seeds are in Ceylon made into flour, but they are also eaten by the hill tribes of India.

Cycas siamensis, Miq.; Kurz, *Burm. For. Fl.*, II., 503.

Habitat.—
eng and dry
Resin.—

CYDONIA, Tourn. (PYRUS, Linn.); *Gen. Pl.*, I., 626.

Cydonia vulgaris, Pers.; *Fl. Br. Ind.*, II., 368; ROSACEÆ.

THE QUINCE.

Syn.—PYRUS CYDONIA, Linn.

Vern.—*Bihl* (abi, according to Ainslie), HIND.; *Bam tsinté*, *bamsutn*, KASHMIR; *Shimar-madalavrai*, TAM.; *Bihl tursh*, *safarjal*, ARAB. Moodeen Sheriff gives the following names for QUINCE seeds:—*Habbus-safarjal*, ARAB; *Bihl-dinah*, *beh-dinah*, *tukhme-abl*, PERS.; *Beh-dinah*, HIND.; *DUK*; *Shimar-madalavrai*, TAM.; *Shune-dalimba-bija*, SING.; *Shime-dalimba-vittulu*, TEL.

References.—Brandis, *For. Fl.*, 205; *Pb. Pl.*, 80; DC., *Origin Cult. Pl.*, *Pharm. Ind.*, 223; Ainslie, *Mat. In Pharm. Ind.*, 211; Dymock, *Mat. A & Tram.*, Med. Pl., I., 104; S. & Mat. Med., Patna, 10, 104, Baden U. Pl. Bomb., 119; Birdwood, *Bom XI.* (Quince used in his day was brought from Crete).

Habitat.—Cultivated in Afghanistan and the North-West Himalaya up to 5,500 feet. DeCandolle says it grows wild in the woods in the north of Persia, near Caucasus and in Anatolia. Sanskrit name is known, but its Persian name is quince, and for the wild plant as to an ancient knowledge of the DeCandolle adds that it may be the epoch of the Trojan War (*Orig. Cult. Pl.*, 237).

Oil.—Baden Powell mentions this as an oil-yielding plant in his *List of Panjab Products*. *Dodonia indica*, *Dene*, a nearly allied plant, is very plentiful in Sikkim, Bhutan, Khasia hills, and Burma. In the Naga Hills the ground at certain seasons is simply covered with the fruit left rotting under the trees. This might easily be put to some economic

Dub or Doorwa Grass.

CYNODON
dactylon.

BENG, *Dhobghás*, SANTAL; *Duba*, *kali ghas*, *rám ghas*, N W, P; *Dhupsa*, *hariati*, C. P; *Durbá*, SANS; *Durva*, *karala*, *haryeli*, MAR; *Arugam pillá*, *hariati*, TAM, *Ghericha*, *haryati* (UPPER GODAVERY), TEL.

References—*Roxb*, *Fl Ind*, Ed. C B C, 97; *Vaigt*, *Hort Sub Cal*, 712; *Thwaites*, *En Ceylon Pl*, 371; *Dalz & Gibs*, *Bomb Fl*, 297; *U. C Dutt*, *Mat Med Hind*, 272, 297; *Dymock*, *Mat Med W Ind*, 2nd Ed., 853; *S Arjun*, *Bomb Drugs*, 153, 347; *Journal Agri Hort Soc Ind.* (1885), VII, Pt III, *Proc CXI*, Report issued Agri Dept (1879), p 105; *Medical Top Dacca*, 60; *Baden Powell*, *Pb Pr*, 314, 2445; *Lisboa*, *U. Pl Bomb*, 208, 276, 279, 283, 290; *Birdwood Bomb. Pr*, 128; *Royle*, *Ill Him Boh*, 421; *Balfour*, *Cyclop*, 869, *Smith, Dic*, 157

Habitat.—A perennial 'creeping grass and flowering all the year round, grows everywhere throughout India, except perhaps in the sandy parts of Western Panjáb, where it is rare. In winter it appears scanty, at which time it may be said to be at rest. It abounds in the Sunderbuns. It is particularly abundant on road sides, delighting apparently in the admixture of sand and gravel which it there gets along with the ordinary soil. It is readily propagated by chopping up the shoots and scattering the pieces over the prepared soil. It ascends from the plains to altitudes of 8000 ft. It is a hardy plant, both in habit and nutritive quality. It makes good

Medicine.—In the *Atharvama Veda* it is said: "May *Durbá*, which rose from the water of life, which has a hundred roots and a hundred stems, efface a hundred of my sins, and prolong my existence on earth."

Hay
2550
MEDICINE,
2560

purposes this grass is often confused with *Eragrostis cynosuroides*. The latter is the *Kash*, *Darbá* or *Dab* (the Gramina of the Portuguese and the Gramen of the Romans but not the *αγρωστις* (*Triticum repens*) of the Greeks), it is used extensively at funeral ceremonies of the Hindus, the chief mourner wearing a ring of the grass. The latter is sacred to Ganesh. Both grasses are indiscriminately used in compound prescriptions with more powerful drugs in the cure of dysentery, menorrhægia, &c. (*Dymock*) *Sakharam Arjun* says—"A white variety, which appears to be only a

2561

This disease may be the same as that which is common in the West Indies, caused by *Pulex penetrans*."

Spina C. 2550
anap
cases
hæa
ghyr)

Julce.
2562

C. 2562

CYNODON
Dactylon

Artichoke; Doorwa Grass

Cymbopogon Nardus, Linn, see *Andropogon Nardus*, Linn, A. 1107

2554

CYNANCHUM, Linn, Gen Pl, 762

[354, ASCLEPIADEE
Cynanchum pauciflorum, Br, Fl Br Ind, IV, 23, Wight, Ic,

Syn — ASCLEPIAS TUNICATA, Roxb Fl Ind Ed C B C, 253 CYNANCHUM PAUCIFLORUM, R Br in Dals & Gibs Bomb Fl 148; CYNOCOTONUM PAUCIFLORUM, Decaisne, Thwaites, En Ceylon Pl, 195

Vern — Chaqul pati BENG, Kan-kumbala, SING

Habitat. — A large twining shrub met with in the Deccan Peninsula, from the Concan southwards to Travancore and Ceylon. This is the region given in the Flora of British India, but according to Roxburgh (*Asclepias tunicata*), it is found in Bengal also.

FOOD
Leaves
2555

Food — The Cinghalese eat the young leaves of this and of many other plants of this natural family, in their curries (*Enumeratio Plantarum Zeylanicæ*, 195)

This does not appear to be the case in Bengal, Roxburgh simply remarking that its milky juice is particularly gummy

CYNARA, Linn, Gen Pl, II, 469.

2556

Cynara Scolymus, Linn, COMPOSITE

ARTICHOKE

Vern — Hali choke, BENG, HIND, Artichoke, kingin, BOMB

References — Voigt, Hort Sub Cal, 425; Stewart, Ph Pl 123; DC Origin Cult Pl, 92, Firminger, Man Gard in Ind, 160; Indian Forester, VIII, 18, and X Jour Agri Hort Soc Ind (1875) V 34; Lisboa, U Pl Bomb, 163, Birdwood, Bomb Pr, 163, Smith, Dic, 25

Habitat — Cultivated to a limited extent over most parts of India for the European market

FOOD
2557

Food — The lower parts of the thick imbricated scales of the flower-heads are called artichoke bottoms, and being thick and fleshy are eaten as a vegetable. Although very generally cultivated the artichoke in India becomes larger and coarser than in Europe. Firminger says it is better known and more generally cultivated in India than in England. Any time from the end of July to the beginning of September is suitable for sowing the seed, which usually germinates in about 10 or 12 days. The seedlings should be transplanted when about a hand high and be placed at about 3 feet apart. They thrive best on a rich soil. The artichoke may also be propagated by suckers which should be separated from the stock in September. In the plains of India it flowers from about the beginning of May, but in the hills a little later.

CYNODON, Pers, Gen Pl, III, 1164

2558

[GRAMINEÆ
Cynodon Dactylon, Pers, Dutcht, Fodder Grass N Ind, 321
CREEPING PANIC GRASS OR DOORWA, COLCH GRASS

Syn — C. SPILLATUS, H. L. J, PANICUM DACTYLON, Linn; PISALUM DACTYLON, DC. DICARPA DACTYLON, Sch

Vern — P. S. damera, dakra Artihar, Akshil ts 12, t 12 PR Furlong TRAVANCORE, D. S. m 12 d. 3 Raj, Chi bur SIND; Dub, d. 12, d. 12.

C. 2558

The Cynoglossum or Dog's-tongue.

CYNOGLOSSUM
micranthum.FODDER,
Hay,
2566

Regarding the curing of hay the following remarks with reference to this grass are of value:—

"Hariali, like most other meadow grasses, should be cut immediately after the dew has fallen. The roots of the grass are more tender when made from the fully developed plant, and it appears, the plant is more vigorous and produces another crop much sooner. Hariali hay is

or so after being cut. It cannot be tossed too high, as the colour and aroma of the hay is absolutely necessary to keep it moving. At night, if the dews are heavy, it should be put up in small cocks, each containing from two to three cwt. These cocks should not be covered with anything, but

and the hay spread out. It

of course putting it again into cock at night.

"Hay thus rapidly made is rich in saccharine matters, and is, therefore, very liable to heat and ferment, this, to a moderate extent, does no harm, in fact it is so that

2567

of the
keep

pieces of the stems of palmyra or cocoanut trees, the one resting on the other so as to form a pipe, will equally effect the purpose, or, in building two or three layers of dry paddy or cholam straw placed in a stack will prevent it heating to any injurious extent."

"CREEPING PANNIC GRASS—Of Eastern Bengal it has been said: This perennial grass is found in great abundance, and is of a superior quality to that of districts to the westward, it grows luxuriantly in the light soil along the banks of the rivers in the southern division, and affords the best pasturage in the district. The juice of the leaves is used medicinally by Hindu practitioners" (*Topography of Oude* by J. Thynne).

2568

CYNOGLOSSUM, Linn., Gen Pl. II., 849

Cynoglossum micranthum, Desf., Fl. Br. Ind., IV., 1361

Vern.—Ailakrai, Pa., Oudhphall, G. S., Adhophall, G. S., Bu kottu, Sikkim.

2569

C. 2560

1954-55 1955-56

CYPERUS
COTTLEBUSH

1. The first part of the document is a letter from the Secretary of the State of New York to the Governor, dated January 1, 1900. The letter is addressed to the Governor and is signed by the Secretary. The letter is dated January 1, 1900.

Compare the following for the same company and country:

100

CONFIDENTIAL

[Faint handwritten notes at the bottom of the page]

2. The following information is being furnished to you for your information:

1. The first part of the document is a letter from the President of the United States to the Congress, dated January 8, 1907. It contains the following text: "I have the honor to acknowledge the receipt of your communication of the 6th inst., and in reply to inform you that the same has been forwarded to the proper authorities for their consideration."

C. *carolinensis* L'Herminier

753

$\frac{E_{\text{max}}}{E_{\text{min}}} = \frac{3.7 \times 10^{-18} \text{ J}}{9.4 \times 10^{-19} \text{ J}} = 3.9$

Very truly yours,
J. Edgar Hoover

Faint handwritten notes at the bottom of the page.

[illegible]

8172

234

311-7

25
11/19/94 11

2532

Discussion

2529

C. 2589

CYPERUS.

Cynometra; Cyperus.

Habitat.—Native in North India and the Himalaya, altitude 1,000 to 8,000 feet, from Kashmir to Bhutan and Pegu; common.

Several species of closely allied plants belonging to this genus are occasionally mentioned by authors as of economic value. It is doubtful how far they have been distinguished. Nessy says *C. officinale* (1).

DYE.

2570

MEDICINE.

2571

CYNOMETRA, Linn.; Gen. Pl., I., 586.

2572

Cynometra cauliflora, Linn.; Fl. Br. Ind., II., 268; LEGUMINOSÆ.

Vern.—*Iripa*, MAL.; *Niam-niam*, MALAY.

Habitat.—A tree of the Western Peninsula, South India, Ceylon, and Malacca.

OIL.

2573

Oil.—It yields an oil said to be prepared in North Arcot, and used for medicinal purposes.

2574

C. polyandra, Roxb.; Fl. Br. Ind., II., 268.

Vern.—*Peng*, CACHAR, SYLHET.

Habitat.—A large evergreen tree of the Khasia Hills, Sylhet, and Cachar.

OIL.

2575

TIMBER.

2576

Oil.—In Spens' *Encyclop.* it is said that the oil which this plant yields is used medicinally.

Structure of the Wood.—Light-red, hard, close-grained. Mann remarks it is very useful for scantlings, and makes good charcoal.

2577

C. ramiflora, Linn.; Fl. Br. Ind., II., 267.

Syn.—*C. bijua*, Spanaghe.

Vern.—*Shinger*, BENG. (as in Gamble); *Irapa*, TAM.; *Mymeng*, *kabeng*, *myeng-kabin*, BURM.; *Galmendrea*, SING.

Habitat.—A large, evergreen tree of the Sunderbans, South India, and Burma, in tidal forests; frequent from Chittagong down to Tenasserim and the Andaman Islands.

DYE.

2578

OIL.

2579

MEDICINE.

2580

It is used in the treatment of leprosy and other cutaneous diseases.

Medicines.—The root is purgative. A lotion is made from the leaves boiled in cows' milk which, mixed with honey, is applied externally in An oil is also prepared

TIMBER.

2581

Skinner says that it is used in the Sunderbans

2582

Cynosurus cristatus, L. is particularly valuable for to a considerable depth.

CYPERUS, Linn.; Gen. Pl., III., 1043.

2583

The roots of several species are tuberous, such, for example, as *C. corymbosus*, *C. esculentus*, *C. stoloniferus*, *C. rotundus*, *C. jemicus*, *C. scariosus*, &c., &c. Several of these are edible, others afford aromatic

C. 2583

Mats and Matting

CYPERUS
malaccensis.*Cyperus inundatus*, Roxb.; Clarke in Linn. Soc. Jour., XXI., 73.

2601

Vern.—*Paṭi*, HIND and BENG.

Habitat.—An aquatic species met in the wheels of some parts of Ben-

Medicine.—Irvine (*Mat. Med. Patra*, 82) writes: "The tubers are used as a tonic and stimulating medicine"MEDICINE,
2602*C. Iria*, Linn.; C.B. Clarke, Linn. Soc. Jour., XXI., 137.

2603

Syn.—*C. PARTIFLORUS*, Nees in Wight Contrib., 87, nec Vahl, nec. C
UMBELLATUS, Roxb., *C. IRIA*, Linn. *asin* Roxb., Fl. Ind., Ed. C B C 67Vern.—*Bura chucha*, BENG.; *Wel keri*, SING

Habitat.—"A native of moist cultivated lands" (Roxb.) Frequent in India, having been collected at Almora (1,200 feet), Mussoorie, Nepal, Sikkim, Sonada (2,200 feet), Assam, Khasia Hills, Lucknow, Patna in Behar, Chutia Nagpur, Central India, Mount Abu, Puna, Mangalore, Ceylon, &c

Fibre.—The culms are used in mat-making.

FIBRE,
Mats,
2604
2605*C. jemicus*, Rottb., C.B. Clarke, Linn. Soc. Jour. XXI., 175Syn.—*C. BULBOSUS*, Vahl, Nees, in Wight, Contrib., 80; Dals and Gids,
Roth. Fl. Ind., *C. jemicus*, Vahl, Kunth, in part
musta, SANS., Thes.dry sandy pasture
del Coast, Clarke
to Sind, Madras,

Ceylon, Abyssinia, and Central Africa

Food.—"The roots are used as flour in times of scarcity and eaten roasted or boiled" When roasted they have the taste of potatoes, and would be valuable for food but that they are so small "Dr James Anderson, in an excursion to the southern part of the Peninsula of India, discovered that the *shislands arisi*, growing in sandy situations by the sea-side, and requiring but little water, was the common food of the natives during a famine, and sent to the taste, and of sago" (Balfour)
into meal and make
other dishes" (Drury)FOOD,
Roots,
2606
Flour,
2607*C. longus*, Linn.; Clarke, Linn. Soc. Jour., XXI., 163

2608

Clarke describes five or six forms of this plant, the type of the species occurring on Mount Abu and in Cabul, β *pallascens*, Roiss, in Egypt, Cordofan, &c, γ *cyprica* in the island of Cyprus, δ *badia* in southern Europe, Madeira, and doubtfully in Madras, ϵ *elongata* in Egypt, Africa, &c*C. malaccensis*, Lam., Clarke, Linn. Soc. Jour., XXI., 147

2609

Syn.—*C. MONOPHYLLUS* Vahl, *C. PANGOREI*, Roxb., Fl. Ind., Fl. C B C,
68; *C. INCURVATUS*, Roxb., p. 66, *C. TEGETIFORMIS*, Benth.; *C. GANGETICUS*, Roxb.Vern.—*Chumati pati*, BENG

C. 2609

CYPERUS
Haspan

Sedges used for

FODDER

2590

2591

Tinnevely, and the article is therefore heavier, coarser in texture, and not so flexible."

Fodder—"Cattle are not fond of it, and it is only eaten occasionally by buffaloes" (Roxb)

Cyperus elegans, Linn, C B. Clarke, Linn. Soc Jour, XXI, 125

Syn—C MESTUS, Kunth, C NIGROVIRIDIS, Thw, En Ceylon Pl, 344

Vern—Wek chan, BURM (Kura, Pegu Rept)

Habitat—A native of Bengal and the Malay Peninsula, Sikkim 1,500 feet, Assam, Khasia hills 1,200 feet, Sylhet, Yunan, Chittagong, Mergui, Tenasserim, and the Andaman Islands

2592

C. esculentus, Linn, C B Clarke Jour Linn Soc, XXI, 178

Syn—C TUBEROSUS, Rottb

Vern—Kaseru dila, Pn, Sha ts'au, CHINESE

Habitat—There are five or six distinct forms of this plant of which two occur in India viz, *forma tuberosa* (sp Rottb) in Madras and *forma hindustanica* in Northern India

Medicine and Food—Stewart says "In N-W Provinces the root is used as food, and is official as *kaseru*. The *dila* root, mentioned by Bellew as eaten in the Peshawar valley, may be the same *dila*, however, appears to be a generic name for the CYPERACEÆ the roots of several of

MEDICINE

Root.

2593

FODD.

Root

2594

FIBRE

2595

Coffee Sub-

stitute

2596

2597

used
subst.

C. exaltatus, Retz; C B Clarke, Linn Soc Jour, XXI, 186

Syn—C UMBELLATUS Lahl; according to Roxb, Fl Ind, FJ C B C
Cot C VENUSTUS R Br, Thwaites En Ceylon Pl, 432 (nec Nees nec
Kunth), C ALTUS Nees, in Wright, Contrib, 84

Vern—Pedda shaka TEL

Habitat.—Commonly found in Bengal (Chutia Nagpur, Rajmahal, &c), and in the Peninsula of India generally (Mysore, Madras Central Ind, Mount Abu, Oudh, &c), and in Ceylon "A large species, growing in standing fresh water" (Roxb)

Fibre—This sedge is often used for matting. Mr O B Clarke describes four forms of the plant, a the type alluded to mainly in the above notes *Pamens* (=C amoenus, Koenig (non Kunth) and C alopecuroides, Roxb) This is met with in Calcutta and in Madras & is distinct native of Egypt but Mr Clarke has also found it at Mutlah in Bengal; he remarks "the type specimens of this at Kew agree exactly with my Calcutta example, so that if C dives is a distinct species, it is an Indian one. The specimens differ from those of Retz's *exaltatus* by the much more numerous glumes to the spikelet which they differ from those of Koenig's *amoenus* in the undotted nodding spikes. C dives may therefore be held a distinct species but whatever it is called it must be removed from C alopecuroides Rottb which has a 2-fid style, a compressed nutlet and a very thick stalk. 2 Ostem is the fourth form, and it is met with at Thy Mysore & Panaji

FIBRE.

2598

Mat.

2599

2600

C. Haspan, Linn, Carl, Linn Soc Jour, XXI, 119

Syn—C HASPAN, Lahl, is the *Pedda shaka* of the Telugus

C. 2600

Mats and Matting.

CYPERUS
SCARIOSUS.

MEDICINE.

dysentery in doses of about a scruple (*Med Top of Dacca* by J. Taylor, p. 54) "In the Concan the fresh tubers are applied to the breast in the form of *lep* (malagma) as a galactagogue. *C. rotundus* is the *κόνεπος* of the Greeks, and is mentioned by Dioscorides, who says it is the *Juncus* or *Radix Junci* of the Romans, and is used as a purgative, and applied to scorpion stings, and it is also an ingredient of arm plasters as an aromatic plant, used by the Scythians for embalming. *κόνεπος* is mentioned in the *Iliad* (21, 351), and *Odyssey* (4, 603), and by Theophrastus in his fourth book, it appears to have been a favourite food of horses. Pliny (21, 18) calls it *Juncus triangularis* or *angulosus*, it is probably the *Juncus* of Celsus (3, 21) mentioned as an ingredient in a diuretic medicine for dropsy, although he calls it *Juncus quadratus*" (*Dymock*, p. 844) Arabian and Persian writers describe the drug as

preferred. They are extensively used as an aromatic adjunct to numerous compound medicines. It is that it is doses as an ingredient in soil are

Special Opinions—§ "Roots are aromatic and commonly used in indigestion of children combined with other aromatics with benefit" (*Assistant Surgeon Shib Chunder Bhattacharya, In Civil Medical Charge, Chanda, Central Provinces*). "Roots are used as an astringent in the diarrhoea and dysentery of children" (*Bolly Chand Sen, Teacher of Medicine*). "The roots are in Chutia Nagpur used in fever" (*Rev A Campbell*). "The fresh roots are stimulant and diaphoretic" (*Bombay Gazette*, VI, p. 14)

Food.—Cattle eat this so-called grass, and hogs are remarkably fond of the roots.

PODDEN.
2616

Cyperus scariosus, R Br, C B C., Linn Soc. Jour, XXI, 159

2617

Syn.—*CYPERUS PERTENSIS*, Forb, Fl Ind, 1d C B C., "

Vern.—*Nagar-múthá*, HINO, *Nágar-mútha*, BHO; *Jamla* MAH; *Soade káfi*, soad, ARAE; *Muikhe samín*, PRUS; *Nágar-muikhe*, SAKS; *Nagar motah*, DEC; *Muttah-kách*, *k'rák kishanú*, IAM; *Tunga gaddala-veru*, *k'latunpa muste* TEL; *Kéra kishanna*, MAL; *Konnari-gadde*, KAN; *Vomon nin*, BURM

References—*Forb*, Fl Ind, Pd C B C., "/; *Med Top Ajmir* 147; *Dymock Mat Ind* 2nd Pd 815; *Irvine Mat Med India*, 75; *Birdwood, Lumb* 1r, 94; *La tard, Djes*, Supp, IV

Habitat.—A delicate, slender grass, met with in damp places in Bengal, Oudh, and rare in the Panjáb, by no means so common a plant as *C. rotundus*

This is apparently the *Koray kalung*, TAM, the *Nagar motah*, DUK, and *Murá*, SAKS, described by *Binshin* (*Mat. Ind* II, 162) under the name of *Cyperus juncifolius*, *Pottler*

Dye—The rhizomes are used in dying, to give a scent to the fabric, and as a perfume for the hair. Roxburgh describes them as "tuberous with many dark-colored silken fibres." "Its naked delicate form, small and compound umbel, of slender leaves and scanty involucre imbedded in a dark, uchy" . . .

DYE
2618

Medicine.—The roots are used as a diuretic and deccant, and as a diaphoretic and diuretic. " . . .

MEDICINE.
Foot.
2619

C 2619

CYPERUS
rotundus

Sedges used for

Habitat.—Roxburgh says of his *C. Pangorei* that it is a native "of the banks of the Ganges, and serves, with *C. inundatus*, the same useful purpose, though in an inferior degree." Of his *C. incurvatus* remarks that it also is a native of the banks of the Ganges "flowering during the cold season." Clarke adds that it occurs at Noakhali, Calcutta, the Sunderbuns, Dacca, and is distributed to Arracan, Pegu, Singapore, Japan, and China.

2610

Cyperus niveus, Retz.; *C.B. Clarke*, *Linn Soc. Jour*, XXI, 108

Vern.—Birmutha, SANTAL

Habitat.—Throughout India Kashmir, Panjab, Kumron, Simla, Kulu, Nagpur, Rajmahal, &c.), Madras, &c., &c. ture land (Roxb)

C. pertenuis, Roxb, see *C. scariosus*, R. Br.

2611

C. Pongareii, Rottb, as in Roxburgh, see *C. malaccensis*; and for other plants named by different authors as *Cyperus Pangorei*, see *Cyperus corymbosus*.

2612

C. rotundus, Linn; *C. B. Clarke*, *Linn. Soc. Jour*, XXI, 167

Syn.—*C. HERASTACHYOS*, Roxb

Vern.—Muthá, mothá, BRNG, Batha-bujr, MUNHARI, Utru banda, URAON, Tandisura SANTAL, Musá, gundra, bhadra muste, mustaka, SANS, Aórai, TAM, Shakhá tunga-jeru, bhadrāmuste, Junga muste, mustakamu, karvatakā muste, gandala, TEL, Musá, barikmoth, BOMB; Aóré k. jhár, DEC., Bimbal, MAR, Motha, GUZ, katon luru, SING

References.—Roxb, *Fl. Ind.*, Ed. C.B.C., 64, *Jour. As. Soc.*, Pt. II (1867), p. 82; Home Dept. Official Corres. regarding Pharm. Ind., 238, Hope's Tour in Bombay, pp. 112, 120, &c., &c., Walter Elliot, *Flora Andhrica*, pp. 25, 76, 184, 120 &c., Moodeen Sheriff, *Sipp. Pharm. Ind.*, 128, V. C. Dutt, *Mat. Med. Hind.*, 243, Dymock *Mat. Med. W. Ind.*, 2nd Ed., 844, S. Arjun, *Bomb. Drugs*, 150, Baden Powell, *Pb. Pr.*, 382, Atkinson, *Him. Dist.*, 734, 808, Birdwood, *Bomb. Pr.*, 94

Habitat.—A plentiful species in India occurring from Kurum Valley, Afghanistan, Gilgit, and Kashmir to Simla, Garhwal, and the Nihiri hills throughout the plains (Lahore, Bengal, Madras), and ascending the mountains of the central table-land (from Mount Abu and Poona to the Nighiri hills). Dr. Hove, who travelled in 1787, speaks of the plant as very abundant in Bombay.

Dye.—Used in certain dye preparations to impart a perfume to the fabric.

Oil.—The rounded rhizomes are said to yield an essential oil, which the natives of Upper India use to perfume their clothes. In Bengal the tubers of this species are more largely used in perfumery than are those of *C. scariosus*, being more plentiful—in fact it is a troublesome weed. Roxb. used "as perfume at the

DYE

2613

OIL

2614

MEDICINE.
Roots.

2615

a diaphoretic and astringent. Stimulant and diuretic properties are also attributed to them. They are further described as vermifuge. In native practice, they are held in great esteem as a cure for disorders of the stomach and irritation of the bowels. The bulbous roots are scraped and pounded with green ginger, and in this form mixed with honey they are given in cases of

C. 2615

Mats and Matting.

CYPERUS
SCARIOSUS.

dysentery in doses of about a scruple (*Med. Top. of Dacca* by *J. Taylor*, p. 54). "In the Concan the fresh tubers are applied to the breast in the form of *lep* (malagma) as a galactagogue. *C. rotundus* is the *κέρπος* of the Greeks, and *κέρπος* is the Persian word, who says it is the *Juncus*

MEDICINE.

is mentioned in the *Iliad* (21, 351), and *Odyssey* (4, 603), and by *Theophrastus* in his fourth book; it appears to have been a favourite food of horses. *Pliny* (21, 18) calls it *Juncus triangularis* or *angulosus*; it is probably the *Juncus* of *Celsus* (3, 21) mentioned as an ingredient in a diuretic medicine for dropsy, although he calls it *Juncus quadratus*" (*Dymock*, p. 844). Arabian and Persian writers describe the drug as

preferred. They are extensively used as an aromatic adjunct to numerous compound medicines.

Special Opinions.—"Roots are aromatic and commonly used in indimatics with benefit" (*Assist. In Civil Medical Charge*, used as an astringent in the *Chand Sen, Teacher of Medicine* used in fever" (*Rev A*

Campbell) "The fresh roots are stimulant and diaphoretic" (*Bombay Gazette*, VI, p. 14)

Fodder.—Cattle eat this so-called grass, and hogs are remarkably fond of the roots.

FODDER.
2616

Cyperus scariosus, *R. Br.*; *C. B. C.*, *Linn Soc Jour*, XXI, 159

2617

Syn.—CYPERUS FERTENUIS, *Roxb*, *Fl Ind*, Ed *C B C*, 66.

Vern.—*Nagar mōtha*, HINDO, *Nagar-mutha*, BENG, *Lawāla*, MAR, *Soade kufi*, SOAD, ARAB, *Mushke samin*, PERS, *Nagar mustaka*, SANS, *Nagar motah*, DEC, *Muttah kach*, Kōrāk kishangu, TAM, *Tunga gaddala veru*, Kōlatunga muste, TEL, *Kēra kishanna*, MAL, *Konnari gadde*, KAN, *Vomon nuu*, BURM

References.—*Roxb*, *Fl Ind*, Ed *C B C*, 66, *Med Top Ajmer*, 147, *Dymock Mat Med W Ind*, 2nd Ed, 815, *Irvine*, *Mat Med Patna*, 75, *Birdwood*, *Bomb Pr*, 94, *Liottard*, *Dyes*, Supp, IV

Habitat.—A delicate, slender grass, met with in damp places in Bengal, Oudh, and rare in the Panjāb, by no means so common a plant as *C. rotundus*

This is apparently the *Koray kalung*, TAM, the *Nagar mothā*, DUK, and *Musta*, SANS, described by *Ainslie* (*Mat*, Ind II, 162) under the name of *Cyperus juncifolius*, *Rottler*

Dye.—The rhizomes are used in dyeing to give a scent to the fabric, and as a perfume for the hair. *Roxburgh* describes them as "tuberous with many dark-coloured villous fibres" "Its naked delicate form, small and compound umbel, short slender leaves, and scanty involucre immediately distinguish it" from the other members of the genus

DYE,
2618

Medicine.—The root is officinal, being considered cordial, stomachic, and desiccant, and is used for washing the hair. Also regarded as diaphoretic and diuretic. "Arabian and Persian writers mention this Indian

MEDICINE,
Root,
2619

C 2619

CYPERUS
tegetum.

Sedges used for

MEDICINE

Cyperus, but consider it to be inferior to *C. rotundus* "Two kinds of *Nagarmoth* are met with in the Bombay market—Surat and Kathiawar, the first is heavier and more aromatic than the second Value, Surat, Rs per maund of 37½lb, Kathiawar Rs 4 The Surat *Nagarmoth* is probably obtained from Rajputana, where the plant is common in tanks (*Dymock*) U C Dutt says "The root of *C. pertenuis* is somewhat tuberous with many dark coloured villous hairs It grows in low wet places, and is chiefly used in the preparation of medicated oils

Special Opinions.—§ "Roots, when bruised, have a fragrant smell, and for wash th a stock of the powdered root to wash th surgeon P Kinsley, Chicacole, Ganjam, M in conjunction with Valerian in cases of epilepsy (Surgeon Major C W Calthrop, M D, 4th Bengal Cavalry, Morar) "The root is astringent, useful in diarrhoea" (Surgeon-Major J M Houston, Durbar Physn, Travancore and Civil Apothecary) "A decoction is used in (Surgeon J. C H Peacocke, ions" (Surgeon Major Robb,

Civil Surgeon, Ahmedabad)

2620

Cyperus stoloniferus, Retz, C B Clarke, Linn Soc Jour, XXI, 172

Syn — *C. LITTORALIS*, R Br, *C. TUBEROSUS*, Baker

Vern — *Jatamansi* a name given in South India to this plant

Perfumery.—As with other scented species the tubers of this plant are

PERFUMERY,
2621

Res, II, 405—IV, 109, and which by Persian and Arab physicians is called *Sanbal* — *Hindi* and *Sanbal ul taib* and in Upper India *Jatamansi* and *Balch har* But as the true plant is only found at great elevations beyond the tropics the term is applied in South India to the sweet-smelling tubers
grass (Sch mon
also under nown

2622

C. tegetiformis, Roxb., C B C, Linn Soc Jour, XXI, 157

Syn — *C. NUDUS* Roxb., Fl Ind, Ed C B C, pp 63 and 70, *C. BENGALENSIS* Spreng

Vern — *Gula-methi*, BENG, Sura, SANTAL

Habitat — "A native of low wet places over Bengal, flowering during the rains" (Roxb) Clarke mentions as localities—Calcutta, Chittagong, Noakhali, Burisal, Mymensing, Pundua, and Assam He also states that the plant occurs in China and Japan

Fibre — Roxburgh writes "This species is very like *C. tegetum*,

FIBRE,
MATS,
2623

2624

C. tegetum, Roxb, C B Clarke, Linn Soc Jour, XXI, 160

Syn.—*C. CORYMBOSUS*, Koehne, in part, *C. SCHIMPERIANUS*, Steud; *C. DENISENS* Steud *C. PANGOREI* Thwaites (non Rottb) Enum II Zeyl, 344 *PAPILLUS DENISENS*, Nees in Wright Contrib 89; *C. PANGOREI*, Nees (the greater part) and *C. CORYMBOSUS*, Nees

C. 2624

Mats and Matting.

CYPERUS
tegetum.

Note by Mr. Clarke: "This plant, abundant in India, is the authentic *C. TEGETUM*, Roxb. It differs decidedly from *C. CORYMBOSUS* in the much more distant glumes, which in the dried specimens have the margins incurved not overlapping. The spikelets are more compressed than those of *C. CORYMBOSUS*. The colour in India varies from pale to a high red-brown; with the more highly coloured Indian examples many African are absolutely identical; but there are other African specimens chestnut or

alt
for
lot
Tl
as
wt
rh
the

Vern.—*Madar-Mai*, BENG; *Wella*, BURM.

Habitat.—A common species in India, Abyssinia, and Egypt. Mr. Clarke mentions the following localities: Almora (1,200 feet), Chumba

culms are split into two or three, and then woven into mats upon a warp of threads previously stretched across the floor of a room. The mat-maker passes the culms with the hand alternately over and under the successive threads of the warp, and presses them home.

In different districts of India it is believed that two or three allied species are used for this purpose. In Madras the form *C. corymbosus* seems to be chiefly used. Royle repeating Roxburgh states "that the culms or stalks of the plant when green are split into three or four pieces, which, in drying, contract so much as to bring the margins in

FIBRE.

Mats,
2625

trade in these sedge-mats has greatly increased, and at the present day it may be said that they form a regular article of export to Europe. In the Trade Returns, however, all mats are collectively returned, so that it is impossible to give the actual figures. The exports of "mats" were last year valued at Rs14,416.

TRADE.
2626

